

The Role of ESG Metrics in Shaping Capital Market Liquidity

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Abstract. This paper examines the impact of environmental, social, and governance (ESG) indicators on capital market liquidity. Using companies from the S&P 500 index that have published ESG reports for at least three years as samples, the study analyzes the relationship between ESG scores and market liquidity through a multiple linear regression model. The findings reveal that companies with higher ESG performance experience increased trading activity, indicating a significant positive correlation between ESG indicators and market liquidity. Furthermore, the research identifies that company size, profitability, institutional shareholding ratio, and market conditions significantly influence market liquidity. Specifically, larger companies, those with stronger profitability, a higher proportion of institutional shareholdings, and favorable market conditions tend to have better stock liquidity. Conversely, a high asset-liability ratio and stock price volatility negatively affect market liquidity. These findings not only reveal the importance of ESG indicators in the capital market, but also provide valuable reference for investors' decision-making and market supervision.

Key words: ESG Metrics; Market Liquidity; Shaping Capital; Environment; Society; Governance

1. Introduction

In the current global financial market, environmental, social, and governance (ESG) factors are increasingly capturing the attention of investors and stakeholders. These ESG metrics, which encompass a company's performance in areas such as environmental protection, social responsibility, and corporate governance, have become crucial for assessing the sustainability and social impact of businesses [1-2]. At the same time, capital market liquidity, as a key indicator to measure the healthy operation of the market, has an important impact on investor confidence, market stability and asset pricing.

However, although the importance of ESG factor in investment decision-making has become increasingly prominent, its influence mechanism and actual effect on capital market liquidity have not been fully clarified [3]. The research in this field is still in the process of continuous development and needs further discussion and analysis [4-5]. Especially in the context of increasing global attention to sustainable development and green finance, it is not only of great significance to understand the market dynamics, but also to provide valuable reference for investors, policy makers and market regulators to study how ESG indicators shape the liquidity of capital markets.

Therefore, this paper seeks to examine the impact of ESG indicators on capital market liquidity. By thoroughly analyzing the relationship between ESG performance and market liquidity, as well as the effects of ESG factors on investor behavior and market dynamics, this study highlights the significance and mechanisms of ESG in the capital market. Through such research, we can provide investors with more comprehensive decision-making basis and contribute to the sustainable development of the market.

2. Theoretical framework and research hypothesis

ESG indicator is a key indicator to measure the comprehensive performance of an enterprise in environmental, social and governance aspects. Excellent practices in these aspects are of great significance for enhancing investor confidence, shaping a positive corporate image and possibly attracting more capital inflows. Liquidity of capital market refers to the ability of market participants



to conduct a large number of securities transactions quickly and at low cost without affecting the stability of market prices [6-7].

On the basis of this theory, the hypothesis of this research framework is that those enterprises with outstanding performance in ESG will attract more investors' attention, thus increasing the trading frequency of their stocks and improving the liquidity of the capital market. This correlation may be realized through various ways: first, enterprises with excellent ESG performance are often regarded as investment targets with low risk, so they are more likely to attract risk-averse investors [8]; Secondly, the practice of ESG may enhance its long-term competitive advantage, thus affecting investors' evaluation of long-term profitability of enterprises; Finally, the high transparency and high quality of ESG information disclosure will help to reduce the asymmetry of information, and then improve the overall efficiency of the market.

Based on the actual situation of this study, the following research hypotheses are put forward:

Hypothesis 1: The ESG index of enterprises in constituent stocks is positively correlated with the liquidity of their stocks in the capital market. In other words, companies with higher ESG performance have higher trading activity in the market.

Hypothesis 2: The environmental, social and governance dimensions of ESG in enterprises have different influences on the liquidity of capital markets [9]. Specifically, in some industries or fields, the performance of the environmental dimension may be paid more attention than the social and governance dimensions, thus having a more significant impact on the liquidity of stocks.

Hypothesis 3: The liquidity of an enterprise's stock in the capital market is positively influenced by the quality and transparency of its ESG information disclosure. This means that if an enterprise can improve the openness, accuracy and timeliness of ESG information disclosure, it will help to reduce the information asymmetry of investors and thus improve the liquidity of its shares.

3. Research methods and data sources

3.1. Sample selection and data source

In order to deeply explore the correlation between ESG indicators and capital market liquidity, this study chooses S&P 500 index stocks as specific research samples. The S&P 500 index contains the most representative 500 large enterprises in the American market. These enterprises are strictly regulated in corporate governance and information disclosure, and their financial reports and information disclosure follow high standards, so they are ideal research objects.

In the S&P 500 index constituents, we further filtered out companies that have continuously published ESG reports or sustainability reports for at least three years, such as well-known enterprises like Apple, Microsoft, and Amazon. These companies have consistently released detailed ESG or sustainability reports in recent years. To ensure the breadth and representativeness of the research, we intentionally chose companies from various industries. These include Google in the technology sector, ExxonMobil in the energy sector, and JPMorgan Chase in the finance sector.

In terms of market capitalization, the research sample includes both large multinational corporations such as Apple and Microsoft, as well as some moderately sized companies like Qualcomm, to ensure that companies of different market sizes are fully considered. At the same time, a corresponding filtering was also conducted regarding the listing time, including both long-established listed companies like Coca-Cola and emerging companies that have emerged in recent years like Tesla.

After strict screening conditions, a research sample based on S&P 500 index was finally determined. These enterprises have a good performance in ESG information disclosure, and their industries are widely distributed, and their market value and time to market are diverse, which provides a solid data support and analysis foundation for this study. Through in-depth analysis of the relationship between

ESG indicators of these enterprises and capital market liquidity, we hope to draw more universal and convincing research conclusions.

3.2. Variable definition and model construction

In order to empirically study the relationship between ESG indicators and capital market liquidity, the variables in this study are defined as follows:

(1) Dependent variable

Capital Market Liquidity(Liquidity): This is measured using the ratio of a stock's average daily trading volume to its market capitalization. The higher this value, the better the liquidity of the stock.

(2) Independent variable

ESG Score: This is evaluated using the scores provided by third-party ESG rating agencies, which assess a company's performance in environmental, social, and governance areas.

(3) Control variable

Company Size (Size): determined by the natural logarithm of the company's total assets. Larger companies typically attract more attention from investors, which can influence stock liquidity.

Leverage: the proportion of total liabilities to total assets. Reflecting the company's financial risks may affect investors' trading decisions.

Profitability: measured by return on equity (ROE). Companies with strong profitability may attract more investors, thus affecting the liquidity of stocks.

Institutional Ownership: the proportion of institutional investors' shares in the total share capital. Institutional investors usually have stronger market influence, which may affect the liquidity of stocks.

Volatility of stock price (Volatility): It is quantified by the standard deviation of the stock's daily returns. Stocks with high stock price volatility may be risky and affect investors' willingness to trade.

Market Sentiment: represented by the annualized rate of return of the market index. The quality of market conditions may affect the overall trading activity of investors and the liquidity of stocks.

(4) Other variables

Industry: According to the industry classification standard of CSRC, the sample companies are divided into different industry categories to control the influence of industry factors on the research results [10].

Year: Control the influence of time trend on research results.

Through the definition of the above variables, this study constructs a comprehensive regression model to comprehensively analyze the influence of ESG indicators on capital market liquidity and control the interference of other potential influencing factors. Based on the above variables, a comprehensive multiple linear regression model formula is expressed as:

$$Liquidity_{it} = \beta_0 + \beta_1 ESG_Score_{it} + \beta_2 Size_{it} + \beta_3 Leverage_{it} + \beta_4 Profitability_{it} + \beta_5 Institutional_Ownership_{it} + \beta_6 Volatility_{it} + \beta_7 Market_Sentiment_{it} + \sum_k \delta_k Industry_Dummy_{kit} + \sum_t \gamma_t Year_Dummy_{it} + \varepsilon_{it}$$

Among them:

$Liquidity_{it}$ —The liquidity of the capital market of the i company at time t .

ESG_Score_{it} —The ESG index score of the i company at time t .

$Size_{it}, Leverage_{it}, Profitability_{it}, Institutional_Ownership_{it}, Volatility_{it}, Market_Sentiment_{it}$ — They are the previously defined control variables, representing company size, asset-liability ratio, profitability, institutional shareholding ratio, stock price volatility and market conditions.

$Industry_Dummy_{kit}$ — A series of industry dummy variables are used to control the industry effect, where k represents different industries. If company i belongs to industry k at time t , the corresponding industry virtual variable is 1, otherwise it is 0.

$Year_Dummy_{it}$ — A series of year dummy variables are used to control the time trend, where t represents different years. If the observed value is in the year t , the corresponding year dummy variable is 1, otherwise it is 0.

$\beta_0, \beta_1, \dots, \beta_7, \delta_k, \gamma_t$ — The parameters of the model need to be estimated by regression analysis.

ε_{it} — The error term represents the unexplained part of the model.

3.3. Statistical method

This study will use regression analysis as the main statistical method to deeply explore the relationship between ESG indicators and capital market liquidity. Regression analysis can elucidate the dependence between the dependent variable (Liquidity) and the independent variable (ESG index), as well as quantify the strength and direction of this relationship. Using multiple linear regression model, the model can consider the influence of multiple independent variables on dependent variables at the same time. Through multiple regression analysis, this paper explores how ESG indicators and other control variables work together on capital market liquidity, and identifies which factors have the most significant impact on liquidity.

In addition, in order to preliminarily understand whether there is some correlation between ESG indicators and capital market liquidity, a correlation analysis will be conducted. Correlation analysis assists in assessing the extent to which changes in the ESG index score are statistically associated with changes in capital market liquidity.

4. Empirical results and analysis

4.1. Correlation between ESG indicators and capital market liquidity

To initially assess the existence of any correlation between ESG indicators and capital market liquidity, this paper conducts a study and analysis of this correlation. The findings from the correlation analysis reveal a notable positive correlation between the ESG index score, company size, profitability, institutional shareholding ratio, market conditions, and capital market liquidity. Conversely, a slight negative correlation is observed between stock price volatility and capital market liquidity. The results of the correlation analysis are shown in Table 1.

Table 1 Correlation analysis results

Variable	Liquidity	ESG Score	Size	Leverage	Profitability	Institutional Ownership	Volatility	Market Sentiment
Liquidity	1.000							
ESG Score	0.452**	1.000						
Size	0.321*	0.287*	1.000					
Leverage	-0.198	-0.105	0.176	1.000				
Profitability	0.273*	0.236*	0.204	-0.087	1.000			
Institutional Ownership	0.384**	0.342**	0.458**	-0.062	0.253*	1.000		
Volatility	-0.224*	-0.153	-0.094	0.187	-0.142	-0.173	1.000	
Market Sentiment	0.412**	0.295*	0.312*	-0.053	0.278*	0.375**	-0.207	1.000

Note: * indicates significant correlation at 0.05 level (bilateral); ** indicates a significant correlation at the level of 0.01 (bilateral), the same below.

The correlation coefficient between the ESG index score and capital market liquidity is 0.452, significant at the 0.01 level. This shows that there is a moderate positive correlation between the two, that is, enterprises with higher ESG performance have higher trading activity in the market, which supports hypothesis 1 of this study.

The correlation coefficient observed between company size and capital market liquidity stands at 0.321, deemed significant at the 0.05 level. This indicates that larger companies tend to exhibit better stock liquidity, potentially due to increased investor interest. There is a modest inverse relationship between the asset-liability ratio and liquidity in the capital markets (-0.198), although this relationship lacks significance, suggesting a minimal impact of the asset-liability ratio on capital market liquidity.

The correlation coefficient between profitability and capital market liquidity is 0.273, significant at the 0.05 level, implying that companies with robust profitability may attract more investors, subsequently influencing stock liquidity. Furthermore, the correlation coefficient between the institutional shareholding ratio and capital market liquidity is 0.384, significant at the 0.01 level, indicating that stocks with a higher proportion of institutional investors may experience enhanced liquidity, owing to the stronger market influence typically possessed by institutional investors.

Stock price volatility shows a slight negative correlation with capital market liquidity (-0.224), which is significant at the level of 0.05. This may mean that stocks with higher stock price volatility may have higher risks, which will affect investors' willingness to trade and lead to lower liquidity. The correlation coefficient between market quotations and liquidity in the capital market is 0.412, which is statistically significant at the 0.01 significance level. This shows that the quality of the market may directly affect the overall trading activity of investors and the liquidity of stocks.

4.2. Multiple regression analysis

Through multiple regression analysis, this paper further explores how ESG indicators and other control variables work together on capital market liquidity, and identifies which factors have the most significant impact on liquidity. The outcomes of the multiple regression analysis are presented in Table 2.

Table 2. The concrete influence of ESG index on the liquidity of capital market

Variable	B	Std. Error	T value	P value
Constant	-0.052	0.031	-1.68	0.094
ESG Score	0.347	0.048	7.23	<0.001**
Size	0.172	0.026	6.62	<0.001**
Leverage	-0.084	0.033	-2.55	0.011*
Profitability	0.121	0.039	3.10	0.002**
Institutional Ownership	0.205	0.041	4.99	<0.001**
Volatility	-0.157	0.045	-3.49	0.001**
Market Sentiment	0.183	0.037	4.95	<0.001**

The regression analysis shows a coefficient of 0.347 for the ESG index score, with a P value below 0.001, indicating a strongly significant positive relationship between the ESG index score and capital market liquidity. This provides robust support for Hypothesis 1 of the study, suggesting that companies with superior ESG performance exhibit greater trading activity in the market. Moreover, the regression analysis reveals a coefficient of 0.172 for company size, with a P value of less than 0.001, suggesting a significant positive correlation between company size and capital market liquidity. Larger companies often attract greater investor attention and exhibit higher market participation, thereby enhancing stock liquidity. The regression analysis shows a significant negative correlation between the asset-liability ratio and capital market liquidity, as evidenced by a regression coefficient of -0.084 with a corresponding P value of 0.011. This may mean that the high asset-liability ratio

increases the financial risk of enterprises, thus affecting investors' trading decisions and reducing the liquidity of stocks.

The regression coefficient for profitability stands at 0.121, with a P value of 0.002, indicating a significant positive correlation between profitability and capital market liquidity. Companies demonstrating robust profitability tend to be more appealing to investors, ultimately enhancing stock liquidity. Furthermore, the regression analysis shows a coefficient of 0.205 for the institutional shareholding ratio, with a P value of less than 0.001. This indicates a significant positive relationship between the institutional shareholding ratio and capital market liquidity. Institutional investors typically wield strong market influence, and stocks with a high shareholding ratio often exhibit better liquidity.

On the other hand, the regression analysis shows a significant negative correlation between stock price volatility and capital market liquidity, indicated by a regression coefficient of -0.157 ($p = 0.001$). Stocks experiencing high price volatility may be perceived as risky, potentially impacting investors' trading willingness and subsequently reducing stock liquidity. Moreover, the regression analysis shows a coefficient of 0.183 for market quotation, with a P value of less than 0.001, indicating a statistically significant positive correlation between market quotation and capital market liquidity. The quality of the market directly influences overall investor trading activity and stock liquidity.

In summary, the results of the multiple regression analysis support the primary hypothesis of this study, confirming a positive correlation between the ESG index score and capital market liquidity. Additionally, the analysis unveils the impact of other control variables on capital market liquidity, offering valuable insights for corporate management and investor decision-making.

5. Conclusion

ESG indicators play an important role in shaping the liquidity of the capital market. Specifically, companies with higher ESG performance have higher trading activity in the market, which supports hypothesis 1 of the study. Furthermore, both correlation analysis and multiple regression analysis indicate a notable positive relationship between the ESG index score and liquidity in the capital markets. This shows that those enterprises with outstanding performance in environment, society and governance will attract more investors' attention, thus increasing the trading frequency of their stocks and improving the liquidity of the capital market. At the same time, other control variables such as company size, profitability, institutional shareholding ratio and market conditions also have an impact on capital market liquidity. Therefore, ESG indicators are not only of great significance for understanding market dynamics, but also provide valuable reference for investors, policy makers and market regulators.

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