

**ESG Performance and Speed of Adjustment to Target Leverage:  
International Evidence from the Role of Interest Rate Policy**

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## **Abstract**

Utilising the partial adjustment approach with global public firms across 28 countries from 2003 to 2020, we examine whether high environmental, social, and governance (ESG) performance results in increased leverage adjustment speed. We are especially interested in how the joint effects of ESG performance and interest rate policies affect firm leverage adjustment speed. We find evidence that firms with better ESG performance experience lower leverage adjustment costs and faster debt management, facilitating faster adjustments in corporate leverage. In addition, the positive effect of ESG performance on leverage adjustment speed is less pronounced in countries with high and potentially more volatile interest rate policies. Our study also demonstrates that strong institutional quality, tightening policy, and good accruals quality reduce information asymmetry and boost the leverage adjustment speed. Interestingly, ESG performance is related to slower corporate leverage adjustments for firms located in countries with low institutional frameworks. There is a positive link between ESG performance and corporate leverage adjustment speed for companies in the top 10% of ESG scores in countries with tightening policies.

*JEL classification: G31, G32, M14.*

*Key words:* Environmental social governance (ESG), the speed of leverage adjustment, interest rate, interest rate policy, Tightening.

## 1. Introduction

The concept of sustainability practices encompasses a company's dedication to the wellbeing of society, fairness, and the perpetuation of the benefit of stakeholders (Mohammad and Wasiuzzaman, 2021). ESG has become a top priority for executives, investors, regulators, and the general public (Freeman, 2010). In the early 1990s, less than 25 companies disclosed ESG data, but by 2016, almost 9,000 companies were issuing sustainability or integrated reports. Moreover, investor interest in ESG data has experienced remarkable growth, with more than 4,902 investors overseeing an impressive \$121.3 trillion in assets signing the Principles for Responsible Investment by the end of 2021. This significant change from approximately 60 investors managing \$6.5 trillion who established these principles in 2006 demonstrates the substantial increase in the investment community's recognition and commitment toward ESG considerations.

Interestingly, Gracia, Siregar (2021) reports that stakeholders are becoming increasingly concerned with comprehending the significance of sustainable investments. This focus aims to minimize agency conflicts associated with free cash flow. Besides, Raimo et al. (2021) suggest that firms may effectively encourage a sustainable environment, improve governance, alleviate asymmetry in information, and lower the cost of capital by implementing ESG practices. According to Eccles et al. (2012), firms with high sustainability levels have a formal stakeholder engagement procedure, which decreases the risk of short-term opportunistic actions. As a result, these companies get tax advantages and are more likely to engage and invest in initiatives with a positive net present value in the future, which is consistent with the stakeholder theory of Jensen (2001).

Prior studies emphasize that a company's capital structure composition plays an essential role in defining its value, cost of capital, and financial risk level (West et al., 2021), determining long-term investment choices, as well as allocating appropriate financing sources (Kumar et al., 2017). Interestingly, Thanh Nguyen et al. (2023) conducted a comprehensive review of capital structure studies, including Dang et al. (2019) and Huang et al. (2021), with the aim of comprehending the determinants of heterogeneity that affect the speed of capital structure adjustment. These fundamental factors can be divided into six categories: firm-specific attributes, corporate governance, financial reporting and managerial incentives, characteristics of the financial markets, informal institutions, and characteristics of the overall economy.

Strebulaev (2007) suggests that firms aim to balance between the advantages and disadvantages of debt by setting a leverage target that can be adjusted over time. These benefits

include tax savings and reduced agency costs, while the costs include financial distress, bankruptcy costs, and conflicts between stockholders and bondholders. Recent empirical research by Byoun (2008) and Huang, Ritter (2009) supports this notion, highlighting that firms have leveraged targets and aim to achieve target corporate leverage in the long term. Several characteristics impact the speed at which enterprises adjust their leverage, including financing requirements, cash flow, significant investments, and deviation from target leverage (Faulkender et al., 2012). Regarding the firm level, empirical studies, such as Warr et al. (2012) and Brisker, Wang (2017), prove these factors. For instance, equity mispricing affects a firm's leverage and the speed of adjustment (Warr et al., 2012), while higher chief executive officer (CEO) inside debt ratios are associated with slower leverage adjustments for underleveraged firms and faster adjustments for overleveraged firms (Brisker et al., 2017).

At the macro level, Huang et al. (2021) examine the relationship between social trust and the pace of corporate leverage adjustment in over 60 countries spanning from 1996 to 2016. They find that a higher level of social trust is related to a faster speed of leverage adjustment. Additionally, this association is more significant for firms situated in nations with lower governance quality. Recently, Adeneye et al. (2023) demonstrate that engaging in environmentally sustainable activities effectively reduces environmental transaction costs, enhances information transparency, and fosters trust between firms and capital providers. Incorporating ESG information significantly diminishes information asymmetry and facilitates faster adjustments in corporate leverage, which leads to tax benefits. Intriguingly, Do et al. (2023) make a noteworthy finding by combining two distinct research areas on corporate sustainability performance and capital structure. The discovery reveals that companies adhering to ethical conduct and offering trustworthy financial information are more likely to attract external funding and investors, resulting in quicker adjustments to leverage, which aligns with the findings of Ho et al. (2021a).

In this study, we investigate the impact of ESG performance on leverage adjustment speed for the following reasons. First, the stakeholder theory proposes that companies strive to attain their stakeholders' long-term goals while benefiting financially in the short term. This calls for transparency and reducing information asymmetry, increasing stakeholder trust, and providing a competitive edge. The theory further highlights the link between sustainable practices and the value of a firm, suggesting that incorporating sustainability measures can lower operating costs and promote greater reliance on debt (El Ghouli et al., 2011, Gerwanski, 2020). According to the trade-off theory of capital structure, the organizations decide about their financing structure by carefully considering the advantages and disadvantages of utilizing

debt and equity (Jensen and Meckling, 1976). Additionally, debt can benefit companies due to its tax-deductible nature, leading to potential financial benefits (Modigliani and Miller, 1958). This theory aids in predicting the costs and benefits associated with debt financing to determine optimal levels of leverage that maximize the firm's value (Titman and Tsyplakov, 2007). Consequently, any deviation from the desired leverage levels should be promptly addressed to preserve the firm's value (Frank and Goyal, 2009). In contrast, companies frequently deviate from their optimal debt levels due to unexpected changes in cash flow and stock prices (Chang et al., 2014). According to Cheng et al. (2014), companies may deviate from their target leverage levels because of significant fluctuations in cash flow and stock prices. Given the increasing influence of ESG on a company's operations and decision-making, as highlighted by Öztekin, Flannery (2012), and the significance of dynamic capital structure in the corporate finance literature, it is necessary to examine the relationship between a firm's ESG practices and the speed of its leverage adjustment.

The study makes several valuable contributions to the existing literature. First, our results confirm a significant and positive association between ESG performance and the speed of adjusting their leverage to reach their target levels. This finding provides strong support for the stakeholder theory of capital structure. In line with previous studies, such as (Breuer et al., 2018, Cao et al., 2019, Cui et al., 2018, Sassen et al., 2016), our research strengthens the evidence that ESG performance can reduce firm risks, lower capital costs, increase transparency, enhance community engagement and stakeholder trust, and improve reputation and brand value. As a result, companies with excellent ESG performance can benefit from reduced leverage adjustment costs, leading to quicker adjustment speeds. Second, the positive relationship between ESG performance and the pace of leverage adjustments is less pronounced for companies situated in countries with high-interest rate policies. Furthermore, firms respond promptly to increasing interest rates by adjusting their target leverage, demonstrating their agility in managing borrowing costs and optimizing financial resources.

We validate the robustness of our findings by incorporating negative interest rate policy as alternative control variables and re-evaluating the baseline model. Interestingly, our study is groundbreaking in examining the joint effects of ESG performance and negative interest rate policy on leverage adjustment speeds. Implementing negative interest rates may encourage companies to pursue new business ventures, invest in research and development, and ultimately increase their future cash flow, which can boost the process of adjusting corporate leverage. However, it is worth noting that the positive impact of a company's ESG performance on the

speed of leverage adjustment may attenuate in countries with more aggressive negative interest rate policies. Our findings further contribute that institutional quality plays a pivotal role in mitigating conflicts of interest, addressing information disparities, alleviating financial constraints, enhancing access to capital markets, and reducing uncertainty. Consequently, companies can adjust their leverage levels more rapidly, aligning with findings from previous research by (Çolak et al., 2018, Ho et al., 2021a, Öztekin, 2022, Öztekin et al., 2012). Interestingly, ESG performance is related to faster (slower) corporate leverage adjustment in countries with strong (weak) institutional frameworks. Moreover, in countries with tightening policies, firms in the top 10% of ESG scores adjust their leverage more quickly, while those in the bottom 10% do so more slowly. Finally, we further explore the combination of ESG performance and the quality of accruals can effectively alleviate information asymmetry, thereby expediting the process of adjusting toward target leverage (Aflatooni and Khazaei, 2020, Bhattacharya et al., 2013, Dufour et al., 2020). In this study, we follow a specific structure: the hypothesis in Section 2, the research design in Section 3, empirical findings in Section 4, and the conclusion in Section 5.

## **2. Hypotheses**

### *2.1 The relationship between ESG performance and leverage adjustment speed*

Our research examines how ESG factors impact firms' leverage adjustments, focusing on maximizing stakeholder value. We estimate that incorporating ESG considerations is critical for reducing information asymmetry and expediting leverage adjustment, confirming stakeholder theory. Strong ESG performance can help decrease this asymmetry, and we have identified two primary ways this is likely to occur. The initial approach stems from the ethical perspective of ESG, as proposed by Phillips et al. (2003), who finds businesses can successfully pursue their interests by upholding high standards of behavior. Firms actively embrace social responsibility as an ethical duty when implementing ESG initiatives and offer investors trustworthy and transparent financial statements, as highlighted by Kim et al. (2012). The second essential component is the output route. Dyck et al. (2019) indicate that firms with remarkable ESG performance can significantly enhance analyst coverage, institutional investment, and shareholder base. This can subsequently lead to the improvement of the firm's financial information quality and reduce information asymmetry. Thus, enterprises must prioritize their CSR performance to get these benefits.

According to Myers, Majluf (1984), firms consider both benefits and costs when adjusting their debt levels to achieve their desired leverage, ultimately maximizing their overall value, which aligns with the trade-off theory. Additionally, adopting more sustainable practices should lead to lower debt costs, such as Eliwa et al. (2021), Cooper, Uzun (2015), and Nguyen, Phan (2020), could potentially approach acquiring debt financing, consequently expediting the process of adjustments to leverage changes (Huang et al., 2021). Specifically, Cooper et al. (2015) discover that ESG adoption is negatively correlated with the cost of debt for U.S. businesses between 2006 and 2013. This demonstrates that creditors perceived these enterprises as trustworthy and less hazardous, making it easier and less expensive for them to get resources than their rivals. The analysis emphasizes that the well-being of stakeholders can have an advantageous effect on a firm's financial status. Eliwa et al. (2021) suggest that lending institutions highly value a company's ESG performance, supporting the legitimacy theory. Firms with strong ESG performance can lower their debt costs, indicating that lenders acknowledge and reward sustainable practices.

Aflatooni et al. (2020) find that corporations with high information asymmetry tend to deviate more from their target leverage, while those with lower information asymmetry adjust more quickly. Yang et al. (2018) suggest that companies involved in socially responsible actions can achieve the speed of leverage adjustment faster due to ESG's benefit in decreasing information asymmetry, which supports the concept that ESG improves transparency and reduces information asymmetry.

A recent study by Ho et al. (2021a) analyzed data from 2,869 publicly listed firms in global evidence between 2002 and 2008. The study explores the relationship between a company's sustainability performance and the pace of leverage adjustment. Firms that prioritize sustainability and exhibit higher ESG performance experience lower costs when adjusting leverage, which results in increased leverage adjustment speed. These studies imply that sustainability practices offer various advantages, such as reducing risks, cutting capital costs, increasing transparency in information, boosting stakeholder engagement, and providing a competitive edge.

Furthermore, Adeneye et al. (2023) examine a sample of 116 non-financial companies listed on the top stock exchanges in five Southeast Asian countries from 2012 to 2019. They find that companies that prioritize environmentally sustainable practices experience decreased environmental transaction costs, increased transparency in information, and strengthened trust in financial institutions. Consequently, their findings demonstrate that sharing ESG information brings benefits such as reduced information asymmetry and faster leverage

adjustment, along with advantages in terms of tax deductibility. Do et al. (2023) conduct a comprehensive analysis of panel data encompassing 3,401 U.S. firms spanning from 1991 to 2014 to examine leverage adjustment speeds. They find that socially responsible businesses prioritize ethical behavior and provide trustworthy financial reports. Their finding implies that firms with better CSR performance exhibit a higher ability to efficiently adjust their leverage levels more quickly to an optimal capital structure. This finding aligns with stakeholder theory and demonstrates the suggestion of implementing sustainable strategies in providing investors and interested parties with enhanced transparency and reliability in financial statement reporting relationship between companies and creditors. As a result, companies with better CSR performance are better positioned to access financing and make leverage adjustments more effectively. Moreover, prior studies demonstrate that companies with strong ESG practices can swiftly adapt their leverage, particularly when confronted with challenges like limited financial resources and a high degree of information failure. In general, our hypothesis proposes that companies with more robust sustainable performance can experience advantages such as improved information transparency and reduced cost of debt, which may lead to faster adjustments in leveraging.

*H1: High environmental, social, and governance (ESG) performance results in increased leverage adjustment speed*

## *2.2 Interest rate and corporate leverage adjustment speed*

Romer, Romer (1994) report that central banks utilize interest rate policy as an effective tool to uphold price stability, foster sustainable economic growth, and manage financial stability. By adjusting interest rates, they can control the cost of borrowing for speculative activities, prevent unsustainable debt accumulation and reduce the risk of financial instability. Bruno, Shin (2015) find that discrepancies in interest rates between a country's lending rate and the U.S. federal funds rate can lead to an increase in banking capital inflows for the country with the higher interest rate. As McCauley et al. (2015) point out, the increase in U.S. dollar borrowing directly results from the easing U.S. monetary policy. With low global interest rates, firms find it more appealing for businesses to issue debt. This has led to investors investing in riskier assets when the risk-free yield is close to zero, subsequently lowering the yield. Consequently, emerging-market firms can borrow money at much lower interest rates.



In 2004, Frank and Goyal conducted a study analyzing all U.S. public non-financial firms from 1952 to 2000 to determine the factors affecting corporate debt and equity adjustments. Through the utilization of the trade-off theory of capital structure and a vector autoregression framework, they firmly conclude that interest rates do not hold any significant impact on either debt or equity (Frank and Goyal, 2004). According to Frank et al. (2009), anticipated inflation and Gross Domestic Product (GDP) growth favorably impact a firm's debt level, whereas increasing corporate earnings of non-financial enterprises have a negative impact. Meanwhile, Graham et al. (2015) find that between 1925 and 2010, the US's unregulated enterprises had higher debt levels when the three-month Treasury Bill rate was high. Interestingly, Karpavičius, Yu (2017) discover that the correlation between interest rates and firm leverage is only significant when market participants anticipate negative real GDP growth. Furthermore, high adjustment costs prevent firms from frequently adjusting their capital structures. Similarly, Campello, Gao, and Qiu (2018) find that higher interest rates decrease firms' leverage, indicating firms adjust their capital structure based on changes in monetary policy.

Furthermore, Opler et al. (1999) examine that publicly traded U.S. firms adjust their leverage ratios more rapidly towards their target when interest rates are high between 1971 and 1994. The study shows that this is due to the increased costs of deviating from their desired capital structure, prompting companies to make instantaneous adjustments. They also highlight the implication of considering interest rates when managing leverage ratios to achieve optimal capital structure. Huang et al. (2009) conduct a study on capital structure theories and how to estimate the speed of adjustment and discover that as interest rates increase, firms are more inclined to adjust their target leverage more rapidly. Implying that firms are highly responsive and proactive in adapting to fluctuations in borrowing costs is consistent with the study by Degryse, Ongena (2007). Lemmon, Zender (2010) study debt capacity and capital structure theories in publicly traded U.S. companies. They propose that as interest rates go up, firms may be motivated to increase their debt levels to take advantage of favorable borrowing conditions before they rise more. Consequently, when borrowing becomes costlier, firms may place greater importance on efficient capital allocation and effective resource utilization. This increased incentive prompts them to adjust their leverage to minimize interest expenses swiftly. By doing so, firms aim to maintain a favorable cost of borrowing and ensure optimal utilization of their financial resources. Overall, the influence of interest rate policy on firms' financial decisions can overshadow the impact of ESG performance. As a result, the effectiveness of

ESG performance in speeding up leverage adjustments becomes less prominent or less effective in those circumstances. Therefore, we develop the following hypothesis.

H2a: *A higher interest rate policy implemented by a country can expedite the process of leverage adjustments in a positive manner.*

H2b: *The positive impact of ESG performance on the speed of leverage adjustments is mitigated in countries with high interest-rate policies.*

### 3. Empirical methodology

#### 3.1 Partial adjustment model of leverage

Our research employs a partial adjustment model to investigate the correlation between a company's ESG performance and its speed of leverage adjustment. Our study builds upon previous research (Do et al., 2023, Faulkender et al., 2012, Ho et al., 2021a) and considers various factors, such as firm-, industry-, and country-specific characteristics. We examine the equation presented below:

$$\text{Target Leverage}_{i,j,t+1} = \delta X_{i,j,t} + \varepsilon_{i,j,t+1} \quad (1)$$

From Eq.(1), notations  $i$ ,  $j$ , and  $t$  represent a firm, country, and year, respectively.  $\delta$  comprises a collection of coefficients associated with firm control variables and country characteristics.  $X_{i,j,t}$  is a vector encompassing variables pertaining to the costs and benefits at varying leverage ratios across firms, industries, and macroeconomic factors, namely ESG score, accruals quality, profitability, tangibility, depreciation, market-to-book ratio, liquidity, size, macroprudential policy tightening, and GDP growth. To address omitted-variable bias, we include ESG scores (definitions in Appendix A1). We introduce firm and year-fixed effects based on Lemmon et al. (2008) to address unobserved disparities. Eq. (1) was estimated separately for each country to accommodate varying coefficients. The unobserved target leverage (Target leverage) was estimated using the fitted value of Eq. (1).

Companies evaluate the trade-offs in adjusting their leverage ratio to reach their target from their current position.

$$\Delta \text{Leverage}_{i,j,t+1} \equiv \text{Leverage}_{i,j,t+1} - \text{Leverage}_{i,j,t} = \eta_j \left( \text{Target Leverage}_{i,j,t+1} - \text{Leverage}_{i,j,t} \right) + \varepsilon_{i,j,t+1} \quad (2)$$

By substituting equation (1) into equation (2) and rearranging, we obtain the following dynamic panel data:

$$Leverage_{i,j,t+1} = (\eta\delta) X_{i,j,t} + (1-\eta) Leverage_{i,j,t} + \varepsilon_{i,j,t+1} \quad (3)$$

The parameter  $\eta$ , representing the pace of leverage adjustment, falls within the range of zero to one. A higher  $\eta$  value is associated with a faster speed of leverage adjustment. Our methodology utilizes FGLS to estimate the panel data in Eq. (3), following the approach of Blundell, Bond (1998). This analysis is designed to effectively address econometric issues that may arise from potential biases and incongruous results when estimating dynamic panel data models. Table 1 in Appendix A2 presents the results of Eq. (3).

### 3.2 The effect of ESG performance on the speed of leverage adjustment

Our hypothesis testing involves examining the impact of a firm's ESG performance on the leverage adjustment speed ( $X$ ) as described in Eq. (3), with respect to its target ratio. Although this speed remains consistent for all firms within a given country, it is influenced by both ESG performance and control variables.

$$\eta_{i,j,t} = \beta_{i,j,t} ESG_{i,j,t} + \varphi_{i,j,t} X_{i,j,t} + \varepsilon_{i,j,t+1} \quad (4)$$

The firm's ESG performance is denoted as  $ESG_{i,j,t}$ , with coefficient vectors  $\beta_{i,j,t}$  and  $\varphi_{i,j,t}$ , while The symbol  $X_{i,j,t}$  denotes a collection of control variables, encompassing both firm-specific control variables and country-specific characteristics. This model utilizes control variables in (Eq.1) and country-level variables to represent the specific characteristics of a given country in a particular year. These variables include GDP growth rate (Cook and Tang, 2010), macroprudential policies (Yang and Suh, 2023), and four interest rate proxies (related to monetary policy, short-term, long-term, and lending rates).

We formulate a partial adjustment model that defines the speed of leverage adjustment by substituting Equation (3) with Equation (4).

$$\Delta Leverage_{i,j,t+1} = (\beta_{i,j,t} \times ESG_{i,j,t} + \varphi_{i,j,t} \times X_{i,j,t}) \times DL_{i,j,t} + \varepsilon_{i,j,t+1} \quad (5)$$

The notation DL is the distance leverage ( $DL_{i,j,t} = Target\ Leverage_{i,j,t+1} - Leverage_{i,j,t}$ ). To account for potential variations stemming from differences in firm, year, country, and industry, we incorporate fixed effects into our model. Through the calculation of Eq. (5), we can determine the value of  $\beta$ , which represents the relationship between ESG performance and the speed of leverage adjustment. When the coefficient ( $\beta$ ) is positive and statistically significant,

it confirms our initial hypothesis that a stronger ESG performance leads to a quicker pace of leverage adjustments.

To test hypothesis 2, we explore how interest rate policy moderates the relationship between ESG performance and the pace of adjusting leverage. This analysis involves incorporating interactions between interest rate policy variables and ESG performance.

$$\eta_{i,j,t} = \beta_{i,j,t} \times ESG_{i,j,t} + \chi_{i,j,t} \times IR_{j,t} + \zeta_{i,j,t} ESG_{i,j,t} \times IR_{j,t} + \varphi_{i,j,t} \times X_{i,j,t} + \varepsilon_{i,j,t+1} \quad (6)$$

$$\Delta Leverage_{i,j,t+1} = \left( \beta_{i,j,t} \times ESG_{i,j,t} + \chi_{i,j,t} \times IR_{j,t} + \zeta_{i,j,t} ESG_{i,j,t} \times IR_{j,t} + \varphi_{i,j,t} \times X_{i,j,t} \right) \times DL_{i,j,t} + \varepsilon_{i,j,t+1} \quad (6a)$$

### 3.3 Variables, data, and sample selection

#### 3.3.1 Firm leverage (Dependent variables)

We utilize two different ratios to measure a company's leverage: the book ratio (Eq. 7) and the market ratio (Eq. 8). This methodology is widely supported by prior research, as evidenced by Im et al. (2022), Faulkender et al. (2012), and Dang et al. (2019).

$$\text{Book leverage}_{i,j,t} = \left( \frac{\text{Total debt}_{i,j,t}}{\text{Total book assets}_{i,j,t}} \right) \quad (7)$$

$$\text{Market leverage}_{i,j,t} = \left( \frac{\text{Market value of liabilities}_{i,j,t}}{\text{Market value of assets}_{i,j,t}} \right)$$

Where : Market value of liabilities<sub>i,j,t</sub> = (Total assets<sub>i,j,t</sub> – Common equity<sub>i,j,t</sub> – Deferred taxes<sub>i,j,t</sub>)

$$\text{Market value of assets}_{i,j,t} = \left( \begin{array}{l} \text{Market value of common equity}_{i,j,t} + \text{Total assets}_{i,j,t} \\ - \text{Common equity}_{i,j,t} - \text{Deferred taxes}_{i,j,t} \end{array} \right) \quad (8)$$

According to Equation 8, *i*, *j*, and *t* represent the firm, country, and year, respectively. The total debt of the firm is calculated by summing its interest-bearing debt, which includes both short-term and long-term obligations.

#### 3.3.2 Environment social governance (independent variables)

We obtain ESG scores from the Thomson Reuters ESG database, which compiles over 400 ESG metrics from public sources and provides a comprehensive score divided into three primary categories: environmental, social, and governance.

The environmental pillar score evaluates a company's level of eco-responsibility, using factors such as emissions reduction, pollution control, adoption of renewable energy sources, development of eco-friendly products, investments in green initiatives, and adherence to standard environmental practices. A composite index is calculated by a weighted score of a company's positive and negative performance across emission reduction, product innovation, and efficient resource consumption indicators.

The social score evaluates a firm's commitment to creating value-added products and services, prioritizing customer security, maintaining a positive community reputation, upholding human rights, promoting diversity and equal opportunities, ensuring excellent job conditions and workplace safety, offering training and development opportunities, and addressing other social concerns for stakeholders. A combined measure is created by calculating a weighted score that considers a company's positive and negative performance on product responsibility, community engagement, human rights, and personnel management indicators.

The governance pillar score assesses how well a firm's systems and procedures work to promote the long-term interests of its shareholders. This evaluation considers primary factors, including transparent sustainability reporting, fairly compensated executives, independent board members, open communication between management and stakeholders, and audit committee members. The composite index is based on a weighted evaluation of the firm's strengths and weaknesses across various indicators of its management and ESG strategies.

### ***3.3.3 Interest rate policy and control variables***

We obtain interest rate data from the OECD and IMF<sup>1</sup> and use four proxies: (1) Short-term interest rate level, (2) Long-term interest rate level, (3) Monetary policy interest rates, and (4) Lending rates. The interest rate policy is an essential aspect in the literature related to interest rates and firm financing policies (Karpavičius et al., 2017). Specifically, firms tend to promptly adjust their leverage ratios to reach their desired targets when interest rates rise. To offset these increased borrowing costs, firms optimize their capital structure and make strategic decisions about allocating resources effectively (Karpavičius et al., 2017). By doing so, they aim to mitigate the impact of higher borrowing expenses and maintain financial stability.

#### *Control variables*

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<sup>1</sup> The IMF may consider adjusting the target interest rate in times of unstable economic growth to boost economic activity.

Regarding firm characteristics, prior studies by Im et al. (2022), Öztekin et al. (2012), Öztekin (2022), and Flannery, Rangan (2006) utilize the dynamic capital structure literature to identify determinants that can affect target leverage and the speed of corporate leverage adjustments. We include the following variables: firm size is determined by taking the natural logarithm of its total assets; tangibility represents net property, plant, and equipment value as a ratio of total assets; profitability is calculated as operating income divided by total assets; Depreciation is calculated as depreciation and amortization divided by total assets; market-to-book ratio is calculated as the market value of total assets divided by the book value of the firm.

We use accruals quality as a measurement tool to assess the dependability of a firm's accounting information system. This aligns with the findings of previous research such as Francis et al. (2008), Kim, Yasuda (2019), Le et al. (2021). According to Bhattacharya et al. (2013), firms with higher-quality accounting information tend to have reduced information asymmetry between managers and shareholders. This can lead to better project selection and improved financial decision-making for the firm. We expect a positive correlation between accruals quality and the speed of leverage adjustment. We use the model proposed by Dechow, Dichev (2002) to compute the accruals quality. The accruals assumption method used in our research is outlined in Equation 9, which considers the variable for company  $j$ , country  $k$ , and period  $t$ .

$$TCA_{j,k,t} = \delta_{0,k} + \delta_{1,k}CFO_{j,k,t-1} + \delta_{2,k}CFO_{j,k,t} + \delta_{3,k}CFO_{j,k,t+1} + \delta_{4,k}\Delta REV_{j,k,t} + \delta_{5,k}PPE_{j,k,t} + \varepsilon_{j,k,t} \quad (9)$$

The calculation of total current accruals ( $TCA_{j,k,t}$ ) is based on the formula  $\Delta CA_{j,k,t} - \Delta CL_{j,k,t} - \Delta Cash_{j,k,t} + \Delta STD_{j,k,t}$ , where  $\Delta CA_{j,k,t}$  represents the change in current assets,  $\Delta CL_{j,k,t}$  represents the change in current liabilities,  $\Delta Cash_{j,k,t}$  represents the change in cash, and  $\Delta STD_{j,k,t}$  represents the change in debt included in current liabilities.  $CFO_{j,k,t-1}$ ,  $CFO_{j,k,t}$ , and  $CFO_{j,k,t+1}$  represent the cash from operations in years  $t-1$ ,  $t$ , and  $t+1$ , respectively. Depreciation and amortization charges are subtracted from the total current accruals to calculate the total accruals. Additionally, the revenue change is denoted as  $\Delta REV_{j,k,t}$ , and the gross property, plant, and equipment is denoted as  $PPE_{j,k,t}$ . The residual error is represented as  $\varepsilon_{j,k,t}$ . All variables are divided by the average total assets of the previous year ( $TA_{t-1}$ ) to address the heteroskedasticity problem. This methodology ensures consistency and allows for accurate measurement and comparison of the variables involved in the analysis.

Liquidity can improve corporate governance by decreasing information asymmetry and lowering the overall cost of leverage adjustment (Chang et al., 2014). Ho et al. (2021a) discover that highly liquid stock has a beneficial effect on the speed of leverage adjustment, encouraging firms to meet their leverage targets more quickly. The study employs country characteristics, including GDP growth rate and macroprudential policy tightening, to estimate their influence on corporate leverage adjustment speeds.

### ***3.3.4 Data and sample***

We obtain firm financial data and ESG scores for the period 2003-2020 from Thomson Reuters Worldscope via Datastream. Additionally, we collect macroprudential policy tightening, as developed by Alam et al. (2019), from the extensive Macroprudential Policy database. The GDP growth rate was sourced from the World Development Indicator, while short-term and long-term interest rates were retrieved from OECD data. Financial interest rates for monetary policy and lending rates were obtained from the IMF's International Financial Statistics.

To begin our corporate leverage, we utilize the 308,292 firm-year observations obtained from Thomson Reuters and Eikons database. We remove observations without corporate leverage data (10,557), missing data for consistency in ESG scores (162,503) from Thomson Reuters and Eikons database and exclude observations missing values in other explanatory variables. We exclude the financial sector (88,962) and the utility sector (28,741). Our study uses a final sample of 17,529 firm-year observations to assess speed of leverage adjustment from 2003 to 2020. To account for the impact of outliers, we utilize a winsorization technique on all continuous variables, setting the 1st and 99th percentiles as cutoff points. Table 1 presents a detailed sample selection process.

## **4. Empirical result**

### ***4.1 Summary statistics***

Our research thoroughly represents the sample distribution across different years and industries from 2003 to 2020 (refer to Table 2). Remarkably, Panel A of Table 2 emphasizes the substantial presence of the industrial sector (4,348) and consumer discretionary sector (3,654), which comprise an impressive 45% of the entire sample. On the other hand, the telecommunications and real estate industries have comparatively lower observations, with

only 655 and 599, respectively. However, Panel B of Table 2 reveals a significant growth in observations, increasing from 142 in 2003 to 1,854 in 2020.

Table 3 displays the means of book and market leverage ratios, as well as overall (individual) ESG scores by country (Panel A), along with the descriptive statistics for all variables from 2003 to 2020, including averages, standard deviations, and quartile values (Panel B). The book leverage and market leverage averages are 0.245 and 0.240, respectively. These figures are marginally higher than those reported by Ho et al. (2021a) from 2002 to 2018, which were 0.227 and 0.219, as well as the values of 0.232 and 0.216 presented by Im et al. (2022) for the period 2003 to 2020. Disparities exist in the mean levels of book and market leverage among the classified groups. The differences between Group 1 and Group 5 are statistically significant, with gap values of 0.439 and 0.528, respectively, signifying notable variations in their measurements. Corporate book leverage shows the highest mean value of 0.354 for firms in Spain. Meanwhile, Greek firms exhibit the highest market leverage, with a mean value of 0.483. On the other hand, Slovenian firms demonstrate the lowest corporate leverage, with a mean value of 0.02 for both book and market leverage.

Regarding sustainability practices, we utilize ESG scores ranging from 0-100 as solid performance indicators, with higher scores indicating better performance. Among our sample, the average ESG score is 45.888, with environmental and social scores averaging 46.789 and 45.713, respectively, and governance at 51.780. There is a significant difference of 58.099 in ESG score means between the rankings of Group 1 and Group 5, indicating variations in measurement. In Table 3, Panel A shows that Brazil, France, and Ireland outperform China and Indonesia in terms of sustainability, thereby highlighting the higher ESG performance of developed nations. Generally, ESG score is slightly lower than the scores reported by Ho et al. (2021a) and Sassen et al. (2016), which are 52.66 and 61.31, respectively. Sassen et al. (2016) conducted a study on European markets, focusing on more developed countries. Meanwhile, Ho et al. (2021a) conducted a global study that encompassed evidence from over 30 different countries. Additionally, our analysis covers global evidence from 2003 to 2020, which could account for the minor differences in our findings.

For the firm control variables, the mean accruals quality is -0.314, showing a significant difference of 0.667 ( $p < 0.000$ ) between Group 1 and Group 5, signifying measurement variations. Sample firms have an average of 4.80% profitability, measured as return on assets, while tangibility and depreciation exhibit mean values of 0.563 and 0.294, respectively. The



Market-to-Book Ratio, Liquidity, and Firm size all have mean values of 2.864, 1.813, and 22.557, respectively. In terms of the country-level control variables, the average values in our sample for macroprudential policy, GDP growth, short-term interest rates, monetary policy interest rates, lending rates, long-term interest rates, and institutional quality are 0.058, 1.254, 1.467, 1.513, 4.631, 2.544, and 1.152, respectively.

#### *4.2 Correlation analysis*

Table 4 presents the results of the Pearson correlation matrix for firm capital structure, ESG performance, and control variables. We discovered a positive correlation between the book and market leverage ratios and overall (individual) ESG scores. This indicates that financial institutions and lenders should consider both a company's book value and market value of assets when assessing their ESG practices and determining whether to increase their debt exposure. Furthermore, there is a strong correlation between ESG scores and their individual components. Regarding the determinants of leverage, profitability and the market-to-book ratio exhibit a negative relationship with corporate leverage (book and market leverage). On the other hand, tangibility, firm size, and depreciation exhibit a positive association with book and market leverage. Importantly, our analysis shows no multicollinearity issue, affirming the validity and reliability of our regression estimates.

We also consider multicollinearity by examining variable correlations and calculating Variance Inflation Factor (VIFs), reliable indicators of multicollinearity. We employ the OLS method to create a transformed model, which removed fixed effects while preserving the exact coefficient estimates as the fixed effects model (Aouadi and Marsat, 2018). This transformation involved subtracting the variable averages and conducting OLS estimations (Chatterjee and Hadi, 2015). None of the VIFs for the analyzed variables exceeded 2, confirming the absence of significant multicollinearity.

#### *4.3. Baseline model: examining how ESG performance influences the pace of leverage adjustment*

As Table 5 shows, we utilize Feasible Generalized Least Squares (FGLS) with book leverage adjustment (Models 1 to 4) and market leverage adjustment (Models 5 to 8) to estimate the partial leverage adjustment (Eq.5). The results show that companies with better ESG performance achieve their target leverage adjustment ratios faster, as demonstrated by significant and positive coefficients in all models ( $p$ -value $<0.01$ ). For instance, in Model 1, a one standard deviation increase (20.812) in ESG scores is associated with a 9.386 percentage point increase in the speed of leverage adjustment, which is economically meaningful. These

results generally support our first hypothesis that higher environmental, social, and governance (ESG) performance leads to faster leverage adjustment, in line with prior research (Adeneye et al., 2023, Do et al., 2023, Ho et al., 2021a). Companies with good ESG performance can reduce transaction costs during the capital issuance process, mitigate information asymmetry among stakeholders, and benefit from lower agency costs, facilitating faster adjustments to their leverage. Furthermore, Kim, Park (2023) and Kim et al. (2014) show evidence that information asymmetry is lower in high-ESG. According to Myers et al. (1984), adopting ESG practices can reduce the expenses of modifying leverage and foster confidence between businesses and investors who require more information. This may lead to the firm's leverage adjusting more quickly.

In Table 5, Models 1 through 8, as well as Figures 1a to 1d, the findings consistently show that the coefficients associated with interest rate policy, including (1) Short-term interest rate level, (2) Long-term interest rate level, (3) Monetary policy interest rates, and (4) Lending rates, are all significantly positive at the 1% significance level. This suggests that companies tend to expedite their leverage adjustments in response to rising interest rates. Our findings have significant economic implications. For example, Model 1 shows that a 2.532 increase in interest rates (equivalent to one standard deviation) leads to a significant 28.358 percentage point acceleration in the speed of firm leverage adjustment. Overall, our findings confirm the second hypothesis (H2a), demonstrating that interest rates positively impact the speed of leverage adjustment, which is consistent with (Agénor and Pereira da Silva, 2012) and implies that firms are particularly responsive and proactive in responding to changes in borrowing expenses.

Interestingly, most control variables incorporated in the FGLS regression model exhibit statistical significance and follow our expectations. Specifically, We find a significantly positive correlation among profitability, tangibility, liquidity, and firm leverage adjustment speed across all models. The findings imply that firms with high profitability and tangible efficiency may necessitate varying credit levels and flexibility for capital decisions. Moreover, they exhibit a higher speed of leverage adjustment, which aligns with the research of (Do et al., 2023, Ho et al., 2021a, Ho et al., 2021b). Liquidity has a significant and positive relationship with the speed of leverage adjustment. This means that liquidity effectively mitigates information asymmetry and supports governance activities, resulting in faster leverage adjustment speeds, aligning with the findings of Chang et al. (2014) and Ho et al. (2021b).

Our research also demonstrates a relationship between the speed of leverage adjustment, depreciation, and company size which indicates that firms with larger sizes and high depreciation rates tend to have more information asymmetry between managers and investors, resulting in slower leverage adjustments (Do et al., 2023, Ho et al., 2021a). Macroeconomic factors such as GDP growth and the tightness of macroprudential policies significantly impact the speed of leverage adjustment. The tightening of macroprudential policy has a significant positive effect on the speed of target leverage adjustment, with a statistical significance level of 1%. This policy helps stabilize the economy by reducing uncertainty and minimizing fluctuations in the business cycle. Angelini et al. (2014) and Rubio, Carrasco-Gallego (2014) suggest that countries with lower uncertainty lead to lower risk premiums, resulting in a more rapid speed of firm leverage adjustment.

#### *4.4 The joint effects of ESG performance and interest rate on leverage adjustment speeds*

Table 6 presents the results for Book leverage adjustment measures in Models 1-4 and market leverage adjustment measures in Models 5-8. The coefficients of ESG performance in all models have a positive effect on the speed of target leverage adjustment, with a statistical significance level of 1% when we control the interaction terms ESG performance and interest rate policy. More importantly, the positive relationship between ESG performance and leverage adjustment speed is weakened for enterprises located in countries with high interest rates. Our findings confirm the second hypothesis (H2b), suggesting that in countries with high-interest rates, other economic factors related to borrowing costs and financial constraints might play a more dominant role in influencing corporate leverage adjustments. The positive effect of ESG performance on the speed of leverage adjustment may be attenuated by these factors, making it less significant for firms in such environments. In addition, the interest rate policy in all models shows a statistically significant positive effect at the 1% level. This suggests that firms expedite their leverage adjustment, making strategic financial decisions to align their capital structure with their target leverage when interest rates increase.

#### *4.5. Further analyses*

##### *4.5.1 The joint effects of ESG performance and negative interest rate policy on leverage adjustment speeds*

We examine and test whether or not the joint effects of ESG performance and negative interest rate policy on the speed of corporate leverage adjustment (the results are shown in Table 7). Sims, Wu (2021) demonstrate that a negative interest rate policy is a strategy central

banks utilize to promote economic expansion and combat deflation risks. In a conventional monetary policy, introducing a negative interest rate policy can significantly impact the process of corporate leverage adjustment, as it directly influences borrowing costs and firms' choices regarding debt financing.

Models 1 to 8 of Table 7 demonstrate that a negative interest rate policy significantly speeds up the adjustment of corporate leverage. At the same time, ESG performance and all interest rate variables encourage the faster speed of corporate leverage adjustment, keeping the baseline models unchanged. These results indicate that negative interest rates may incentivize firms to undertake new projects, invest in research and development, and improve future cash flows. These positive outcomes, in turn, can accelerate the process of corporate leverage adjustment. In Models 1-8, we find that the interaction terms between negative interest rate policy and ESG performance have a negative impact, significant at the 5% level (except for Model 4, which is significant at the 1% level). This suggests that the positive correlation between leverage adjustment speed and ESG performance is less pronounced for firms in countries with a negative interest rate policy.

#### *4.5.2 The joint effects of ESG performance and institutional quality on leverage adjustment speed.*

In Table 8, we show the relationship between ESG performance and institutional quality and their combined effect on corporate leverage adjustment. Institutional quality has a positive and statistically significant correlation with the speed of corporate leverage adjustment at the 1% level (Models 1-8 of Panel A). Besides, our findings demonstrate a reduction in the positive impact of ESG performance on leverage adjustment speed when institutional quality is taken into account. This pattern is consistent across all Models 1 to 8 of Panel B. This suggests that the institutional environment significantly influences the resolution of agency conflicts, the reduction of information asymmetry, and the enhancement of access to capital markets, enabling companies to adjust their leverage more rapidly, which is consistent with (Çolak et al., 2018, Öztekin, 2022, Öztekin et al., 2012).

#### *4.5.3 The effects of ESG performance on leverage adjustment speeds: the role of accruals quality*

In Table 9, we show the joint effects of ESG performance and the quality of accruals on leverage adjustment speed. In Models 1 to 8, we found that ESG performance coefficients are statistically significant and positively affect the speed of adjustment at the 1% level, except in

Models 2 and 3, where the  $p$ -value is below 0.05. This implies that ESG performance has a beneficial effect on the pace of adjustment leverage, even when taking accruals quality into account. These findings are consistent with our baseline results. Besides, accruals quality has a positive and statistically significant correlation with the speed of corporate leverage adjustment. As demonstrated by previous studies, high accruals quality can decrease information asymmetry between managers and investors, offering more reliable accounting information, which aligns with the findings of several studies (Aflatooni et al., 2020, Bhattacharya et al., 2013, Dufour et al., 2020) and ultimately leads to expedite the process of corporate leverage adjustment. An important point to emphasize is that the role of accruals significantly impacts the association between ESG performance and leverage adjustments, as evident across all models and panels. Furthermore, for companies exhibiting higher accruals quality, the strength of the positive connection between ESG performance and the pace of leverage adjustment is notably reduced.

#### *4.5.4 ESG pillars and leverage adjustment speeds*

To confirm our baseline results, we assess three key components of ESG (environmental, social, and governance). Our evaluation centers on these ESG pillars, calculating their performance based on average scores. ESG components, as the primary explanatory variables for change in the book leverage (see Panel A of Table 10) and market leverage regressions (see Panel B of Table 10), remain unchanged in the baseline analysis. Our findings show that the ESG performance pillars exert a significant and positive influence on the pace of adjustment in all models, with statistical significance at the 1% level. The impact of ESG performance is consistent across all models, indicating that superior ESG performance encourages faster corporate leverage adjustments.

#### *4.5.5 The effects of ESG top 10% on leverage adjustment speeds*

We further test an analysis to determine if firms with the top 10% ESG performance affect firms' leverage adjustments. Models 1 to 8 of Table 11, show that our findings indicate companies with the best ESG performance positively impact firms' leverage adjustments, which is consistent with our baseline analysis (refer to Table 11 for details).

#### *4.5.6 Exclusion of firms operating in the U.S. and the group of seven countries (G7)*

We examine whether the positive effects of ESG on leverage adjustment remain consistent when excluding U.S. companies (6,865 firm-year observations) and the group of seven (totaling 13,276 firm-year observations). Our findings confirm that strong ESG performance

continues to facilitate faster corporate leverage adjustments in all models which is consistent with our baseline analysis (detailed results in Table 12).

#### *4.5.7 Splitting samples by Institutional Quality*

We investigate the influence of ESG performance on the speed of corporate leverage adjustments by dividing our sample into categories of high and low institutional quality. In Panel A of Table 13, Models 1 to 4 reveal that in countries with strong institutional quality, high ESG performance positively affects firms' speed of leverage adjustments, which is consistent with the baseline models. Conversely, in countries with weaker institutional frameworks (Models 5-8), the coefficients of ESG performance exhibit negative effects on the speed of leverage adjustments. Our findings suggest that firms operating in countries with weak institutional frameworks meet greater information asymmetry and challenges in accessing market capital. Consequently, ESG performance may slow the speed of leverage adjustment.

Interestingly, our results in both Panels A and B of Table 13 show that the interaction terms of interest rate policy and ESG performance in all models show a statistically significant negative effect at the 1% level, indicating that in nations characterized by high-interest-rate policies, there was a mitigated positive correlation observed between ESG performance and the speed at which corporations adjusted their leverage levels. More specifically, the interaction results of ESG performance and corporate leverage adjustment speed exhibit larger coefficients for firms in countries with high institutional quality than with low institutional quality.

#### *4.5.8 ESG performance and the speed of corporate leverage adjustments: the role of Tightening*

We assess how a U.S. tightening policy affects the association between ESG performance and corporate leverage adjustment speeds. According to Edwards et al. (2016), changes in tightening measures in a company's financial constraints are caused by macroeconomic fluctuations that impact external debt expenses and accessibility. This data is obtained from the Senior Loan Officer Opinion Survey (SLOOS), which is executed by the Federal Reserve Board (see the variables definition in Appendix A1 and the time series of U.S Tightening policy in Figure 2). Table 14 displays the results for changes in book leverage measures in Models 1-4 and market leverage measures in Models 5-8. The positive correlation between ESG performance and the speed of adjustment toward the target leverage ratio remains unchanged after accounting for the tightening policy, according to the coefficients of ESG performance in all models, which are positive and statistically significant at the 1% level. Models 1-8 of Table 14 present that the tightening U.S. policy benefits firms in quickly adjusting target leverage.

This indicates that a country employing tightening procedures can incentivize companies to reduce their dependence on debt, ultimately promoting long-term financial stability, in line with prior studies Yarba, Güner (2020) and Yang et al. (2023).

#### *4.5.9 The joint effects of ESG top, bottom 10% and tightening on corporate leverage adjustment*

We test how the interaction terms of ESG top (bottom) 10% and tightening policy influence the speed of corporate leverage adjustment. Table 15 indicates that the interaction terms for ESG scores in the top 10%, when combined with Tightening and distance leverage (ESG top 10%  $\times$  Tightening  $\times$  DL), are statistically significant and positive for all models. This suggests that a positive link strengthens between ESG performance and the speed of leverage adjustment for firms with excellent ESG scores and national tightening policies. Conversely, when examining the interaction terms ESG bottom 10%  $\times$  Tightening  $\times$  DL, we find that the coefficients are statistically significant and negative in all models, suggesting that for enterprises with poor ESG scores operating in nations with tightening policies, the positive correlation between ESG performance and the pace of leverage adjustment declines significantly.

## **5. Conclusion**

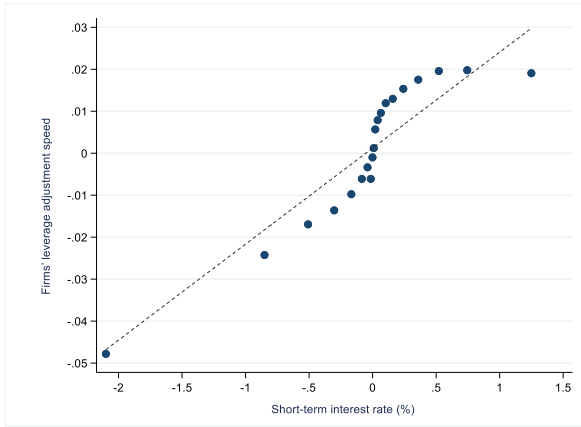
In recent years, there has been an increasing trend of the incorporation of ESG issues into corporate capital structure decisions. We explore the impact of ESG performance on leverage adjustment speed by using the FGLS method to analyse a global panel dataset of public firms from 2003 to 2020. We show that ESG performance has a significantly positive impact on firms' leverage adjustment speed for both book value and market value adjustments. This indicates that the incorporation of ESG information is crucial for reducing information asymmetry, fostering greater stakeholder trust, and providing companies with a competitive edge, which supports the stakeholder theory (Breuer et al., 2018, Cui et al., 2018). Moreover, it enables firms to make quicker adjustments in managing their debt effectively.

We also find the relationship between a company's ESG performance and its leverage adjustment speed is less significant in high-interest-rate countries, suggesting that other economic factors affecting borrowing costs and financial constraints may have a more pronounced influence on corporate leverage adjustment speed. In addition, we investigate the joint effects of ESG performance and negative interest rate policies on leverage adjustment speeds. Negative interest rates may encourage corporations to invest in additional projects and research and development, leading to faster leverage adjustments. However, in firms operating

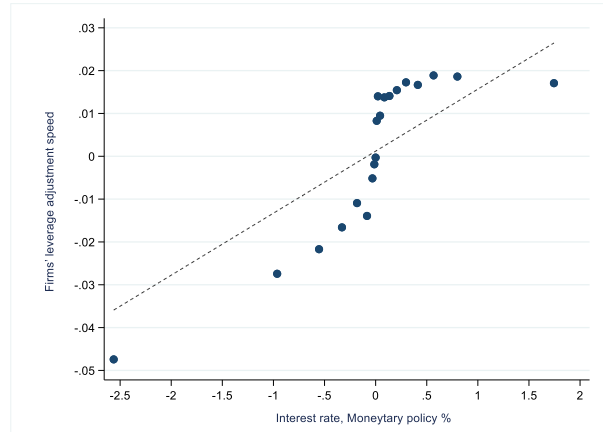
in countries with negative interest rate policies, the positive relationship between ESG performance and leverage adjustment speed is less pronounced. ESG performance is related to faster corporate leverage adjustments in countries with strong institutional frameworks. This finding suggests that the institutional environment plays a role in facilitating cost-effective methods for firms to reduce information asymmetry, improve engagement with stakeholders, and thereby expedite corporate leverage adjustments (Çolak et al., 2018, Öztekin, 2022, Öztekin et al., 2012). Interestingly, we find the positive link between ESG performance and corporate leverage adjustment speed for companies in the top 10% of ESG scores in countries with tightening policies. Tightened U.S. policies allow firms to rapidly adjust their target leverage, signalling that a country implementing such measures can incentivise companies to reduce their dependence on debt, thereby promoting long-term financial stability.

We also find that the quality of accruals, a crucial metric for accounting information reliability, is a significant characteristic of the positive correlation between ESG performance and the pace of leverage adjustments. The analysis indicates that the quality of accruals reduces information asymmetry between an organisation and its external stakeholders. Stakeholders can make more accurate assessments of a firm's financial health as they have access to trustworthy data, thereby decreasing volatility and expediting the process of leverage adjustment (Aflatooni & Khazaei, 2020; Bhattacharya et al., 2013; Dufour et al., 2020). Overall, our research has significant implications for both organisations and the macroeconomic context. Corporate leaders should focus on investing in sustainable activities to increase leverage adjustment speed and boost the overall value of their firms. Moreover, from a policy standpoint, ESG investments are pivotal in influencing a company's financial performance. It is essential for governments to implement regulations that promote better sustainable practices and create supportive institutional environments.

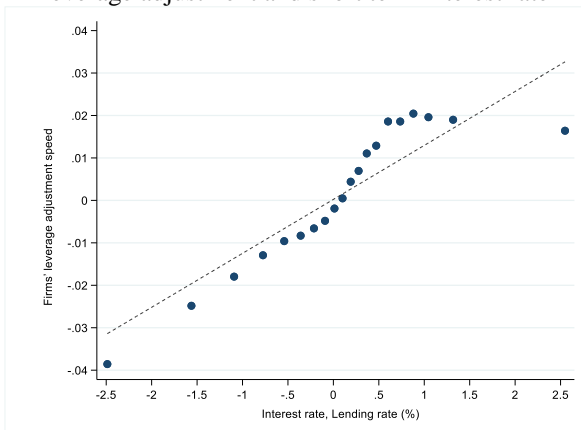




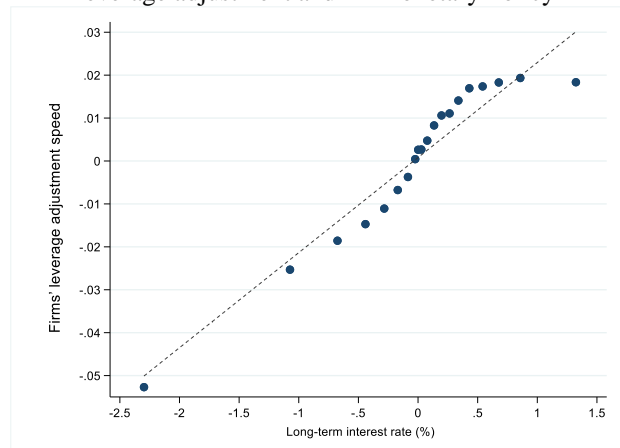
(a) The nonlinear relationship between the speed of leverage adjustment and short term interest rate



(b) The nonlinear relationship between the speed of leverage adjustment and IR Monetary Policy



(c) The nonlinear relationship between the speed of leverage adjustment and IR Lending Rate



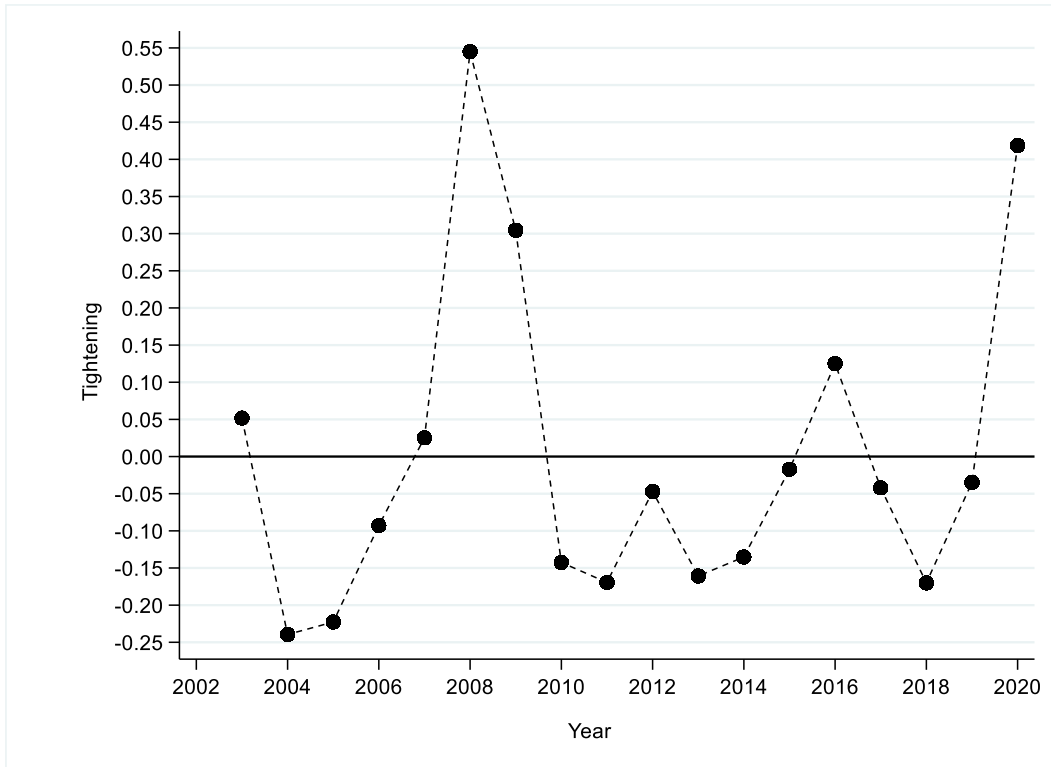
(d) The nonlinear relationship between the speed of leverage adjustment and long term interest rate

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Note: These figures demonstrate the distribution of the nonlinear relationship between the speed of adjustment towards target leverage and interest rate policy from global publicly firms over 2003 to 2020. The effects of interest rate policy positively on firms' leverage adjustment speed.

**Figure 1:**

**The nonlinear effects of interest rate policy positively impact on firms' leverage adjustment speed**



Note: Between 2003 and 2005, there was a gradual reduction in the Federal Funds Rate, which refers to the interest rate at which banks lend to one another. However, Hsu, Chen (2021) indicate that the Federal Reserve implemented its quantitative easing (QE) policies in late November 2008, resulting in the accumulation of assets worth over \$4 trillion until their termination in October 2014. In response to the economic fallout from the COVID-19 recession in 2020, interest rates were swiftly lowered, and emergency measures such as QE and lending facilities were promptly enacted.

**Figure 2:**  
**Time series of U.S Tightening policy**

**Table 1**  
**Sample selection**

<b>Procedure</b>	<b>Firm-year obs.</b>
Observations from the Thomson Reuters and Eikons database, 2003-2020	308,292
<i>Less:</i>	
<i>Observations lacking corporate leverage</i>	<i>(10,557)</i>
<i>Observations with missing data for the measure of consistency in ESG scores</i>	<i>(162,503)</i>
<i>Observations from Utilities sector</i>	<i>(28,741)</i>
<i>Observations from Financials sector</i>	<i>(88,962)</i>
<b>Final balanced sample (1,960 firms)</b>	<b>17,529</b>

The table outlines the steps taken to choose the sample for this study. The final sample consisted of 17,529 firm-year observations with 1,960 firms from 2003 to 2020.

**Table 2**  
**Sample distribution by year and industry**

**Panel A: Distribution of samples by industry**

<b>GICs Code</b>	<b>Industry classifications</b>	<b>Frequency</b>	<b>Percent (%)</b>	<b>Accumulation percentage (%)</b>
10	Energy	1,177	6.71	6.71
15	Basic Materials	2,202	12.56	19.27
20	Industrials	4,348	24.80	44.07
25	Consumer Discretionary	3,654	20.85	64.92
30	Consumer Staples	1,729	9.86	74.78
35	Health Care	1,628	9.29	84.07
45	Technology	1,577	9.00	93.07
50	Communications services	655	3.74	96.81
60	Real Estate	559	3.19	100.00
<b>Total</b>		<b>17,529</b>	<b>100.00</b>	

**Panel B: Distribution of samples by year**

<b>Year</b>	<b>Frequency</b>	<b>Percent (%)</b>	<b>Accumulation percentage (%)</b>
2003	142	0.81	0.81
2004	293	1.67	2.48
2005	445	2.54	5.02
2006	631	3.60	8.62
2007	689	3.93	12.55
2008	715	4.08	16.63
2009	781	4.46	21.09
2010	890	5.08	26.16
2011	945	5.39	31.55
2012	1,037	5.92	37.47
2013	1,078	6.15	43.62
2014	1,109	6.33	49.95
2015	1,119	6.38	56.33
2016	1,213	6.92	63.25
2017	1,363	7.78	71.03
2018	1,551	8.85	79.87
2019	1,674	9.55	89.42
2020	1,854	10.58	100.00
<b>Total</b>	<b>17,529</b>	<b>100.00</b>	

Note: This table shows the distribution of samples by industry and year from 2003 to 2020.

**Table 3**  
**Descriptive statistics**

**Panel A: Descriptive statistics by country**

	Country	Obs.	Book Leverage	Market Leverage	ESG Score	Environmental score	Social score	Governance score
1	Australia	337	0.210	0.218	43.694	40.566	41.940	56.133
2	Austria	127	0.292	0.365	46.750	45.198	47.366	51.905
3	Belgium	195	0.228	0.268	46.591	48.831	46.793	48.812
4	Brazil	196	0.312	0.358	57.050	54.799	61.212	54.939
5	Canada	1,225	0.250	0.260	41.683	38.661	41.185	53.217
6	Chile	124	0.295	0.300	40.958	39.031	39.963	48.268
7	China	396	0.251	0.289	31.548	29.839	22.571	47.706
8	Colombia	25	0.303	0.331	53.591	47.721	58.428	58.389
9	France	905	0.252	0.300	58.372	63.554	61.159	49.858
10	Germany	717	0.230	0.283	53.347	54.160	56.116	49.978
11	Greece	91	0.282	0.483	35.323	38.706	38.024	44.240
12	India	446	0.219	0.201	51.002	45.578	54.391	50.908
13	Indonesia	166	0.205	0.180	39.230	34.383	43.295	43.840
14	Ireland	95	0.277	0.221	57.897	62.963	62.925	55.352
15	Israel	33	0.187	0.192	46.654	39.718	48.969	56.154
16	Italy	188	0.317	0.393	56.385	54.956	59.692	57.006
17	Japan	3,291	0.194	0.248	44.227	51.481	37.437	51.156
18	Luxembourg	29	0.220	0.291	58.503	55.187	64.465	50.715
19	Netherlands	356	0.279	0.294	56.985	57.633	63.179	51.953
20	New Zealand	109	0.267	0.212	43.731	39.512	39.215	57.940
21	Portugal	61	0.349	0.379	55.180	53.448	57.211	54.476
22	Slovenia	3	0.002	0.002	57.907	47.509	68.299	50.000
23	South Africa	535	0.228	0.224	51.148	45.251	52.086	56.625
24	Spain	287	0.354	0.401	55.511	58.574	62.865	45.335
25	Sweden	11	0.186	0.146	49.899	13.255	67.970	70.379
26	Switzerland	631	0.209	0.176	49.167	50.396	51.913	48.341
27	United Kingdom	85	0.313	0.256	54.561	62.508	54.909	51.992
28	US	6,865	0.263	0.205	43.190	41.559	44.333	52.484
	<b>All sample</b>	<b>17,529</b>	<b>0.245</b>	<b>0.240</b>	<b>45.888</b>	<b>46.789</b>	<b>45.713</b>	<b>51.780</b>

Note: This table presents key firm variables categorized by country, with detailed explanations for each variable available in Appendix A1.

**Table 3 (continued)**

**Panel B: Descriptive statistics for all variables**

Variables	N	Mean	Std.Dev	Ranking by group						Mean difference t-test	Anova F statistics
				G1	G2	G3	G4	G5	G5-G1		
Book Leverage	17,529	0.245	0.157	0.040	0.152	0.234	0.319	0.479	0.439	250.00***	38,026.75***
Market Leverage	17,529	0.240	0.193	0.024	0.110	0.198	0.317	0.552	0.528	260.00***	40,592.21***
<b>ESG performance</b>											
ESG	17,529	45.888	20.812	17.937	32.038	44.722	58.710	76.036	58.099	400.00***	75,415.19***
Environmental score	17,529	46.789	26.351	9.741	28.969	47.557	64.626	83.050	73.309	490.00***	81,691.42***
Social score	17,529	45.713	24.295	13.599	29.441	43.562	60.395	81.570	67.971	430.00***	81,573.96***
Governance score	17,529	51.780	21.882	20.499	38.225	52.441	66.026	81.708	61.209	400.00***	73,943.84***
<b>Firm control variables</b>											
Accruals quality	17,529	-0.314	0.295	-0.743	-0.354	-0.239	-0.157	-0.076	0.666	98.46***	7,290.09***
Profitability	17,529	0.048	0.090	-0.048	0.027	0.048	0.073	0.140	0.187	75.94***	3,796.02***
Tangibility	17,529	0.563	0.432	0.078	0.277	0.485	0.760	1.215	1.137	180.00***	23,255.48***
Depreciation	17,529	0.294	0.575	0.033	0.125	0.221	0.357	0.734	0.701	35.72***	969.80***
Market to Book ratio	17,529	2.864	2.616	0.778	1.410	2.102	3.157	6.871	6.092	110.00***	9,015.58***
Liquidity	17,529	1.813	1.140	0.770	1.196	1.525	2.009	3.567	2.797	120.00***	11,187.42***
Size	17,529	22.557	1.475	20.556	21.785	22.485	23.298	24.658	4.102	230.00***	32,089.69***
<b>Country characteristics</b>											
Macroprudential policy tightening	17,529	0.058	0.183	-0.174	0.000	0.033	0.129	0.300	0.474	130.00***	11,418.67***
GDP growth	17,529	1.254	2.787	-3.209	0.964	1.888	2.451	4.177	7.386	150.00***	15,744.69***
Short term IR	17,529	1.467	1.940	-0.145	0.255	0.654	1.769	4.801	4.947	180.00***	23,870.09***
IR Monetary Policy	17,529	1.513	2.138	-0.037	0.125	0.597	1.820	5.059	5.096	120.00***	11,567.72***
IR Lending Rate	17,529	4.631	4.911	1.446	2.989	3.470	4.770	10.483	9.037	55.56***	2,279.50***
Long term IR	17,529	2.544	2.110	0.232	1.343	2.209	3.102	5.832	5.600	170.00***	18,627.73***
Institutional quality	17,529	1.152	0.478	0.386	1.183	1.252	1.324	1.616	1.230	130.00***	12,167.95***

Note: This table presents descriptive statistics for 17,529 firm-year observations spanning from 2003 to 2020.

**Table 4**  
**Correlation Coefficients**

	<b>Variables</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>	<b>(5)</b>	<b>(6)</b>	<b>(7)</b>	<b>(8)</b>	<b>(9)</b>	<b>VIF</b>	<b>1/VIF</b>
(1)	Book Leverage	1										
(2)	Market Leverage	0.0757***	1									
(3)	ESG	0.0850***	0.0305***	1							1.820	0.550
(4)	Environmental score	0.0653***	0.0474***	0.896***	1						1.420	0.706
(5)	Social score	0.0734***	0.0270***	0.800***	0.494***	1					1.270	0.790
(6)	Governance score	0.0935***	0.0210**	0.761***	0.334***	0.398***	1				1.080	0.925
(7)	Accruals quality	0.0328***	0.0309***	0.0671***	0.0549***	0.0646***	0.0643***	1			1.420	0.702
(8)	Profitability	-0.0191**	-0.0367***	-0.0219**	-0.0243***	-0.0211**	-0.0163*	-0.0556***	1		1.200	0.831
(9)	Tangibility	0.105***	0.136***	0.0630***	0.0880***	0.0788***	0.0449***	0.0218**	-0.0337***	1	1.500	0.665
(10)	Depreciation	0.0260***	0.0534***	0.0497***	0.0725***	0.0637***	0.0298***	-0.00392	-0.0184**	0.199***	1.150	0.866
(11)	Market to Book ratio	-0.0226	-0.0959	-0.0847	-0.0675	-0.0817	-0.0832	0.124	0.089	0.0113	1.000	0.998
(12)	Liquidity	-0.309***	-0.308***	-0.148***	-0.141***	-0.127***	-0.143***	-0.0281***	0.0684***	-0.134***	1.630	0.615
(13)	Size	0.232***	0.257***	0.641***	0.594***	0.575***	0.612***	0.161***	-0.0776***	0.0654***	1.300	0.771
(14)	Macroprudential policy tightening	0.0663***	0.0238***	0.197***	0.142***	0.197***	0.200***	0.0207**	0.00427	-0.0018	1.030	0.972
(15)	GDP growth	-0.0156*	-0.0625***	-0.178***	-0.145***	-0.175***	-0.166***	0.0377	0.0119	-0.0153*	1.270	0.784
(16)	Short term IR	-0.0227***	-0.0478***	-0.136***	-0.129***	-0.121***	-0.124***	-0.0172*	-0.0129	-0.0297***	1.230	0.814
(17)	IR Monetary Policy	-0.0234***	-0.0581***	-0.136***	-0.128***	-0.124***	-0.122***	-0.0159*	-0.012	-0.0259***	1.060	0.944
(18)	IR Lending Rate	-0.0153*	-0.0693***	-0.119***	-0.130**	-0.115***	-0.0888***	-0.0189**	-0.0054	-0.0357***	1.030	0.974
(19)	Long term IR	-0.0219**	-0.0364***	-0.183***	-0.164***	-0.185***	-0.157***	-0.0192**	-0.0973	-0.0349***	1.340	0.744
(20)	Institutional quality	-0.0200**	-0.0345***	-0.0111	-0.0122	-0.0131	-0.00623	-0.0109	0.0151*	0.0776***	1.030	0.975
	<b>Variables</b>	<b>(10)</b>	<b>(11)</b>	<b>(12)</b>	<b>(13)</b>	<b>(14)</b>	<b>(15)</b>	<b>(16)</b>	<b>(17)</b>	<b>(18)</b>	<b>(19)</b>	<b>(20)</b>
(10)	Depreciation	1										
(11)	Market to Book ratio	0.0861	1									
(12)	Liquidity	-0.0514***	-0.0508	1								
(13)	Size	-0.00674	-0.0266***	-0.284***	1							
(14)	Macroprudential policy tightening	-0.0045	0.0152	-0.0392***	0.114***	1						
(15)	GDP growth	-0.0427***	-0.073	-0.0196**	-0.0507***	0.144***	1					
(16)	Short term IR	-0.0818***	-0.0187	-0.0674***	-0.0891***	-0.0423***	0.384***	1				
(17)	IR Monetary Policy	-0.0748***	-0.0335	-0.0599***	-0.108**	-0.0590***	0.452***	0.444***	1			
(18)	IR Lending Rate	-0.0776***	-0.019	-0.0444***	-0.120**	-0.0640***	0.331***	0.437***	0.223***	1		
(19)	Long term IR	-0.0919***	-0.0266	-0.0560***	-0.143**	-0.175**	0.335**	0.386**	0.347***	0.275***	1.000	
(20)	Institutional quality	0.101***	-0.0172	0.0909***	-0.102**	-0.331***	-0.293***	-0.528***	-0.456***	-0.474***	-0.498***	1.000

Note: This table displays correlation coefficients between variables, with significance levels indicated as \*\*\*, \*\*, and \* for p-values < 0.01, < 0.05, and < 0.1, respectively. Variable definitions are in Appendix A1.

**Table 5**

Effects of ESG performance and interest rate on leverage adjustment speeds

Variables	Book leverage adjustment				Market Leverage adjustment			
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	0.00312*** [32.864]	0.00227*** [5.838]	0.00264 [-0.065]	0.00240*** [11.524]	0.00223*** [8.911]	0.00229*** [5.452]	0.00307 [-0.083]	0.00278*** [21.524]
<b>Interest rate policy</b>								
Short term IR× DL	0.112*** [25.918]				0.113*** [17.595]			
IR Monetary Policy× DL		0.0363*** [7.724]				0.0346*** [26.877]		
IR Lending Rate× DL			0.0468*** [21.226]				0.0326*** [13.088]	
Long term IR × DL				0.122*** [26.055]				0.115*** [18.480]
<b>ESG performances</b>								
ESG× DL	0.451*** [8.945]	0.465*** [6.192]	0.358*** [5.669]	0.305*** [7.397]	0.408*** [7.030]	0.552*** [6.984]	0.275*** [3.853]	0.184*** [3.408]
<b>Firm control variables</b>								
Accruals quality × DL	0.0267*** [9.350]	0.0171*** [4.117]	0.0169*** [6.688]	0.0322*** [12.573]	0.0212*** [6.593]	0.00677*** [2.908]	0.0121*** [2.797]	0.0143*** [3.118]
Profitability × DL	0.0517*** [3.159]	0.0912*** [6.530]	0.0291* [1.951]	0.0506*** [3.889]	0.0729*** [3.576]	0.153*** [10.317]	0.0807*** [4.753]	0.0885*** [4.325]
Tangibility × DL	0.0175*** [4.261]	0.00313 [0.330]	0.0250*** [3.216]	0.0196*** [6.024]	-0.0036 [-0.722]	0.0104 [1.089]	0.0271*** [3.059]	0.00269 [0.587]
Depreciation × DL	-0.0126** [-2.297]	-0.00884 [-0.577]	-0.0524*** [-4.161]	-0.00982** [-2.032]	-0.0111* [-1.930]	-0.0264* [-1.767]	-0.0361** [-2.573]	-0.00423 [-0.761]
Market to Book ratio × DL	0.79 [1.497]	1.000* [1.881]	0.930* [1.744]	0.672 [1.269]	0.772 [1.487]	0.968* [1.848]	0.991* [1.874]	0.841 [1.619]
Liquidity × DL	0.0882** [1.972]	0.171*** [2.667]	0.229*** [4.284]	0.0904** [2.289]	0.103** [2.259]	0.268*** [4.334]	0.129*** [2.586]	0.174*** [-4.798]
Size × DL	-0.0159*** [-10.916]	-0.0131*** [-7.092]	-0.0102*** [-6.031]	-0.0128*** [-10.301]	-0.00914*** [-5.547]	-0.0170*** [-8.919]	-0.0102*** [-5.320]	-0.00775*** [-6.416]
<b>Country characteristics</b>								
Macroprudential policy tightening × DL	0.0214*** [5.723]	0.0242*** [4.074]	0.0181*** [3.375]	0.0235*** [7.533]	0.0143** [2.568]	0.0330*** [5.748]	0.0162*** [2.657]	0.0224*** [4.229]
GDP growth × DL	0.00374 [1.129]	0.0337*** [7.862]	0.0227*** [5.234]	0.00509* [1.680]	0.0118*** [3.143]	0.0368*** [9.228]	0.0228*** [5.874]	0.00043 [0.096]
Firm-, Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529
Wald $\chi^2$ (Prob > $\chi^2$ )	3,017*** 0.000	438*** 0.000	1,694*** 0.000	3,366*** 0.000	1,052*** 0.000	3,856*** 0.000	311*** 0.000	766*** 0.000

Note: This table presents the results of an FGLS regression analysis that investigates the influence of ESG performance and interest rates on the speed of leverage adjustment. The study employs a partial adjustment model, with the dependent variable representing the change in book and market leverage ratio ( $LEV_{i,j,t+1} - LEV_{i,j,t}$ ). The leverage deviation from the target (DL) is multiplied by all independent variables. The ESG measures a company's ESG performance across three primary dimensions: environmental, social, and governance. Short-term IR is the average interest rate (three-month Treasury) during the year, Long-term IR is the average interest rate (ten-year Treasury) during the year, IR Money policy is the financial interest rates related to money policy, and IR lending rate is the financial interest rates related to lending rate. Each regression considers characteristics at the firm, industry, and country levels, including Accruals quality, Profitability, Tangibility, Depreciation, Market-to-Book ratio, Liquidity, Size, Macroprudential policy tightening, and GDP growth. All variables are defined in Appendix A1. Standard deviations remain unaffected by heteroskedasticity. The asterisks \*\*\*, \*\*, and \* indicate significance levels at 1%, 5%, and 10%, respectively.



**Table 6**

Effects of ESG performance and interest rate on leverage adjustment speeds – Using interactions term  
ESG and interest rate policy

Variables	Book leverage adjustment				Market Leverage adjustment			
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	0.00265*** [29.699]	0.00229*** [5.885]	0.00499** [1.215]	0.00221*** [7.797]	0.00199*** [5.559]	0.00216*** [5.089]	0.00125** [-0.292]	0.00307*** [37.907]
<b>Interest rate policy</b>								
Short term IR× DL	0.240*** [32.889]				0.233*** [20.194]			
ESG × Short term IR × DL	-0.112*** [-20.571]				-0.109*** [-13.829]			
IR Monetary Policy×DL		0.0671*** [4.757]				0.0778*** [5.359]		
ESG ×IR Monetary Policy × DL		-0.00793*** [-2.620]				-0.00884*** [-2.757]		
IR Lending Rate× DL			0.0720*** [12.093]				0.0607*** [8.644]	
ESG × IR Lending Rate × DL			-0.00731*** [-5.134]				-0.00566*** [-3.537]	
Long term interest rate×DL				0.195*** [15.922]				0.215*** [24.461]
ESG × Long term IR × DL				-0.0194*** [-7.262]				-0.0228*** [-10.572]
ESG× DL	0.700*** [13.067]	0.506*** [6.741]	0.355*** [5.418]	0.341*** [7.534]	0.330*** [4.601]	0.583*** [7.295]	0.376*** [4.833]	0.452*** [8.698]
<b>Firm control variables</b>								
Accruals quality × DL	0.0159*** [5.279]	0.0182*** [4.338]	0.0165*** [10.100]	0.0271*** [7.791]	0.0119** [2.567]	0.00839*** [3.561]	0.0157*** [3.687]	0.00722 [1.478]
Profitability × DL	0.122*** [7.337]	0.0909*** [6.476]	0.0124 [0.855]	0.0411*** [2.708]	0.264*** [13.257]	0.146*** [9.638]	0.0738*** [3.914]	0.165*** [8.219]
Tangibility × DL	0.00366 [0.776]	0.00513 [0.537]	0.0180*** [3.234]	0.00954** [2.368]	0.0224*** [6.635]	0.0142 [1.477]	0.0178*** [2.830]	0.0217*** [5.758]
Depreciation × DL	-0.0101* [-1.815]	-0.0115 [-0.748]	-0.0401*** [-3.961]	-0.00629 [-1.201]	-0.0356*** [-7.959]	-0.0317** [-2.104]	-0.0319*** [-2.906]	-0.0128** [-2.382]
Market to Book ratio × DL	0.996* [1.837]	1.019* [1.914]	1.094** [2.042]	0.907* [1.695]	1.140** [2.182]	0.978* [1.863]	1.031* [1.936]	0.821 [1.560]
Liquidity × DL	0.0526 [1.193]	0.173*** [2.722]	0.137*** [3.263]	-0.164*** [-3.244]	0.128** [2.164]	0.256*** [4.084]	0.0900* [1.684]	-0.0903** [-2.372]
Size × DL	-0.0196*** [-14.634]	-0.0139*** [-7.614]	-0.00903*** [-5.746]	-0.00862*** [-5.965]	-0.0143*** [-6.931]	-0.0170*** [-8.849]	-0.00966*** [-4.738]	-0.0218*** [-16.724]
<b>Country characteristics</b>								
Macroprudential policy tightening × DL	0.0180*** [3.954]	0.0229*** [3.836]	0.0137*** [2.664]	0.0129*** [3.532]	0.0275*** [4.318]	0.0309*** [5.330]	0.0162*** [2.598]	0.0497*** [10.213]
GDP growth × DL	0.000529 [0.132]	0.0344*** [8.422]	0.0311*** [8.544]	0.00730** [2.068]	0.00216 [0.554]	0.0346*** [8.184]	0.0203*** [4.890]	-0.0132*** [-2.827]
Firm-, Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529
Wald $\chi^2$	3,826***	634***	697***	983***	1,062***	941***	435***	6,199***
(Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: This table presents the results of an FGLS regression analysis for Eq. (6a) that investigates the joint effect of ESG performance and interest rates on the speed of leverage adjustment.  $\Delta \text{Leverage}_{i,j,t+1} = (\beta_{i,j,t} \text{ESG}_{i,j,t} + \gamma_{i,j,t} \text{IR}_{i,j,t} + \zeta_{i,j,t} \text{ESG}_{i,j,t} * \text{IR}_{i,j,t} + \varphi_{i,j,t} X_{i,j,t}) \times \text{DL}_{i,j,t} + \varepsilon_{i,j,t+1}$

The study employs a partial adjustment model, with the dependent variable representing the change in book and market leverage ratio ( $LEV_{i,j,t+1} - LEV_{i,j,t}$ ). The leverage deviation from the target (DL) is multiplied by all independent variables. The interaction terms (ESG×IR) include four proxies of interest rate (ESG × Short term IR, ESG ×IR Monetary Policy, ESG × IR Lending Rate, ESG × Long term IR). The ESG measures a company's ESG performance across three primary dimensions: environmental, social, and governance. Short-term IR is the average interest rate (three-month Treasury) during the year, Long-term IR is the average interest rate (ten-year Treasury) during the year, IR Money policy is the financial interest rates related to money policy, and IR lending rate is the financial interest rates related to lending rate. Each regression considers characteristics at the firm, industry, and country levels, including Accruals quality, Profitability, Tangibility, Depreciation, Market-to-Book ratio, Liquidity, Size, Macroprudential policy tightening, and GDP growth. All variables are defined in Appendix A1. The brackets contain the t-statistics. The asterisks \*\*\*, \*\*, and \* indicate significance levels at 1%, 5%, and 10%, respectively.

**Table 7**

Effects of ESG performance and interest rate on leverage adjustment speeds – using negative interest rate policy

Panel A: The effect of ESG performance on leverage adjustment speeds while controlling a negative interest rate policy								
Variables	Book leverage adjustment				Market Leverage adjustment			
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	-0.00476*** [-17.663]	-0.00358*** [-10.041]	-0.00617*** [-19.560]	-0.00542*** [-16.903]	-0.00598*** [-23.487]	-0.00529*** [-35.687]	-0.00597*** [-28.032]	-0.00512*** [-26.584]
<b>Interest rate policy</b>								
Short term IR× DL	0.0693*** [12.647]				0.0774*** [13.635]			
IR Monetary Policy× DL		0.0331*** [8.053]				0.0317*** [19.778]		
IR Lending Rate× DL			0.0348*** [18.055]				0.0391*** [36.861]	
Long term IR × DL				0.122*** [34.488]				0.104*** [22.545]
Negative IR policy× DL	0.184*** [115.108]	0.187*** [108.199]	0.189*** [105.964]	0.193*** [158.251]	0.191*** [109.881]	0.195*** [104.593]	0.194*** [100.447]	0.191*** [113.583]
<b>ESG performances</b>								
ESG × DL	0.387*** [8.459]	0.528*** [9.068]	0.327*** [7.039]	0.384*** [10.429]	0.287*** [6.011]	0.702*** [13.415]	0.650*** [14.144]	0.218*** [5.117]
<b>Firm control variables</b>								
Accruals quality × DL	0.0228*** [6.153]	0.0237*** [6.116]	0.0277*** [10.017]	0.0341*** [10.326]	0.0171*** [4.843]	0.0272*** [7.319]	0.0233*** [6.712]	0.0223*** [6.418]
Profitability × DL	0.0297*** [2.790]	0.0863*** [6.192]	0.0268*** [2.406]	0.0261*** [2.260]	0.0490*** [4.443]	0.110*** [7.996]	0.0883*** [8.018]	0.150*** [12.178]
Tangibility × DL	0.0187*** [4.879]	0.0221*** [2.970]	0.0248*** [4.442]	0.0211*** [5.940]	0.0138*** [3.316]	0.0173*** [2.198]	0.0272*** [4.107]	0.0137*** [3.608]
Depreciation × DL	-0.0131*** [-2.645]	-0.0255*** [-2.108]	-0.0462*** [-5.611]	-0.0159*** [-3.374]	-0.00934*** [-1.816]	-0.0192 [-1.543]	-0.0359*** [-3.596]	-0.0202*** [-4.514]
Market to Book ratio × DL	0.0819** [2.311]	0.0803** [2.270]	0.0596 [1.392]	0.0819* [1.924]	0.0821** [2.171]	0.0830** [2.192]	0.0605 [1.382]	0.0867* [1.947]
Liquidity × DL	0.124*** [2.768]	0.348*** [6.740]	0.152*** [3.406]	0.0297 [0.727]	0.0368 [0.845]	0.302*** [7.742]	0.226*** [4.613]	0.0896*** [4.409]
Size × DL	-0.00386*** [-2.501]	-0.0154*** [-10.175]	-0.00164 [-1.091]	-0.00444*** [-3.678]	0.000322 [0.207]	-0.0148*** [-10.795]	-0.0152*** [-14.939]	-0.00518*** [-4.725]
<b>Country characteristics</b>								
Macroprudential policy tightening × DL	0.0196*** [4.632]	0.0467*** [14.703]	0.0303*** [9.264]	0.0459*** [13.551]	0.0297*** [6.796]	0.0511*** [14.903]	0.0372*** [9.138]	0.0413*** [15.433]
GDP growth × DL	0.0109*** [5.864]	0.0225*** [7.025]	0.0224*** [8.435]	-0.0110*** [-4.195]	0.000326 [0.097]	0.0220*** [7.205]	0.0294*** [10.252]	-0.0140*** [-4.851]
Firm-,Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529
Wald $\chi^2$ (Prob > $\chi^2$ )	13,701*** 0.000	13,914*** 0.000	12,520*** 0.000	30,273*** 0.000	12,696*** 0.000	15,598*** 0.000	38,585*** 0.000	27,474*** 0.000

Note: We investigate the correlation between ESG performance and leverage adjustment speeds while accounting for a negative interest rate policy. The

table presents the results of an FGLS regression analysis:  $\Delta \text{Leverage}_{i,j,t+1} = (\beta_{ESG} \text{ESG}_{i,j,t} + \chi_{IR} \text{IR}_{i,j,t} + \zeta_{IR} \text{Negative IR policy}_{i,j,t} + \phi_{X} X_{i,j,t}) \times \text{DL}_{i,j,t} + \varepsilon_{i,j,t}$

The study employs a partial adjustment model, with the dependent variable representing the change in book and market leverage ratio ( $\text{LEV}_{i,j,t+1} - \text{LEV}_{i,j,t}$ ). The leverage deviation from the target (DL) is multiplied by all independent variables. A negative IR policy is a dummy variable that takes the value of one if a negative Interest Rates policy is implemented and zero otherwise. The ESG measures a company's ESG performance across three primary dimensions: environmental, social, and governance. Short-term IR is the average interest rate (three-month Treasury) during the year, Long-term IR is the average interest rate (ten-year Treasury) during the year, IR Money policy is the financial interest rates related to money policy, and IR lending rate is the financial interest rates related to lending rate. Each regression considers characteristics at the firm, industry, and country levels, including Accruals quality, Profitability, Tangibility, Depreciation, Market-to-Book ratio, Liquidity, Size, Macroprudential policy tightening, and GDP growth. All variables are defined in Appendix A1. The brackets contain the t-statistics. The asterisks \*\*\*, \*\*, and \* indicate significance levels at 1%, 5%, and 10%, respectively.

**Table 7 (continued)**

Effects of ESG performance and interest rate on leverage adjustment speeds –  
using interaction term ESG and negative interest rate policy

Panel B: The joint effect of ESG performance and a negative interest rate policy on leverage adjustment speeds								
Variables	Book leverage adjustment				Market Leverage adjustment			
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	-0.00483*** [-18.037]	-0.00445*** [-12.384]	-0.00613*** [-24.007]	-0.00545*** [-16.974]	-0.00627*** [-23.804]	-0.00575*** [-20.503]	-0.00633*** [-23.887]	-0.00545*** [-24.593]
<b>Interest rate policy</b>								
Short term IR× DL	0.0703*** [13.082]				0.0701*** [12.864]			
IR Monetary Policy× DL		0.0378*** [9.118]				0.0334*** [11.100]		
IR Lending Rate× DL			0.0439*** [23.765]				0.0385*** [17.427]	
Long term IR × DL				0.121*** [34.159]				0.0843*** [18.304]
Negative IR policy× DL	0.191*** [51.865]	0.194*** [47.085]	0.195*** [46.179]	0.211*** [85.147]	0.198*** [47.712]	0.202*** [47.527]	0.205*** [45.675]	0.200*** [47.842]
<b>ESG performances</b>								
ESG× DL	0.385*** [8.529]	0.763*** [12.800]	0.752*** [16.393]	0.347*** [9.609]	0.393*** [6.923]	0.925*** [14.109]	0.692*** [11.919]	0.428*** [9.311]
ESG×Negative IR policy×DL	-0.151** [-1.991]	-0.204** [-2.015]	-0.205** [-1.992]	-0.382*** [-5.762]	-0.167** [-1.967]	-0.190** [-2.039]	-0.225** [-2.289]	-0.182** [-2.152]
<b>Firm control variables</b>								
Accruals quality × DL	0.0232*** [6.246]	0.0299*** [6.450]	0.0356*** [10.742]	0.0344*** [10.432]	0.0178*** [4.826]	0.0225*** [5.200]	0.0248*** [7.102]	0.0185*** [6.006]
Profitability × DL	0.0326*** [3.044]	0.107*** [7.166]	0.0788*** [6.985]	0.0238** [2.103]	0.0379** [2.522]	0.123*** [8.058]	0.0702*** [4.951]	0.0310*** [2.578]
Tangibility × DL	0.0183*** [4.761]	0.0329*** [4.270]	0.0288*** [6.195]	0.0218*** [6.182]	0.0147*** [3.469]	0.0383*** [4.539]	0.00698 [1.045]	0.00568 [1.448]
Depreciation × DL	-0.0129*** [-2.610]	-0.0382*** [-2.989]	-0.0496*** [-6.088]	-0.0167*** [-3.577]	-0.00875* [-1.723]	-0.0342** [-2.541]	-0.0016 [-0.144]	-0.00738 [-1.537]
Market to Book ratio × DL	0.0812** [2.303]	0.0808** [2.224]	0.0369 [0.635]	0.0817* [1.918]	0.0903** [2.371]	0.0488 [0.820]	-0.0147 [-0.248]	0.100*** [2.685]
Liquidity × DL	0.116*** [2.637]	0.412*** [7.809]	0.312*** [7.221]	-0.0119 [-0.301]	0.0214 [0.474]	0.285*** [5.249]	0.0454 [0.815]	0.106*** [4.757]
Size × DL	-0.00352** [-2.325]	-0.0189*** [-12.376]	-0.0133*** [-11.789]	-0.00276** [-2.289]	-0.000262 [-0.158]	-0.0208*** [-16.199]	-0.00982*** [-6.942]	-0.00300** [-2.292]
<b>Country characteristics</b>								
Macroprudential policy tightening × DL	0.0192*** [4.560]	0.0574*** [11.233]	0.0325*** [10.819]	0.0437*** [13.224]	0.0353*** [6.866]	0.0672*** [12.092]	0.0188*** [3.984]	0.0235*** [6.071]
GDP growth × DL	0.0103*** [5.109]	0.0175*** [4.457]	0.0288*** [10.715]	-0.0108*** [-4.132]	-0.000865 [-0.268]	0.0209*** [5.295]	0.0308*** [10.432]	-0.00803*** [-2.838]
Firm-,Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529
Wald $\chi^2$ (Prob > $\chi^2$ )	13,459*** 0.000	13,293*** 0.000	19,035*** 0.000	76,616*** 0.000	12,408*** 0.000	15,423*** 0.000	13,350*** 0.000	13,045*** 0.000

Note: The negative interest rate policy moderate the relationship between ESG performance and the speed of leverage adjustment. This table presents the results of an FGLS regression analysis:  $\Delta \text{Leverage}_{i,j,t} = (\beta_{ESG} \text{ESG}_{i,j,t} + \chi_{IR} \text{Negative IR policy}_{i,j,t} + \zeta_{ESG} \text{ESG}_{i,j,t} * \text{Negative IR policy}_{i,j,t} + \varphi_{i,j,t} X_{i,j,t}) \times \text{DL}_{i,j,t} + \varepsilon_{i,j,t}$

The study employs a partial adjustment model, with the dependent variable representing the change in book and market leverage ratio ( $\text{LEV}_{i,j,t+1} - \text{LEV}_{i,j,t}$ ). The leverage deviation from the target (DL) is multiplied by all independent variables. A negative IR policy is a dummy variable that takes the value of one if a negative Interest Rates policy is implemented and zero otherwise. The ESG measures a company's ESG performance across three primary dimensions: environmental, social, and governance. Short-term IR is the average interest rate (three-month Treasury) during the year, Long-term IR is the average interest rate (ten-year Treasury) during the year, IR Money policy is the financial interest rates related to money policy, and IR lending rate is the financial interest rates related to lending rate. Each regression considers characteristics at the firm, industry, and country levels, including Accruals quality, Profitability, Tangibility, Depreciation, Market-to-Book ratio, Liquidity, Size, Macroprudential policy tightening, and GDP growth. All variables are defined in Appendix A1. The brackets contain the t-statistics. The asterisks \*\*\*, \*\*, and \* indicate significance levels at 1%, 5%, and 10%, respectively.

**Table 8**

Effects of ESG performance and interest rate on leverage adjustment speeds – using Institutional quality

Panel A: The effect of ESG performance on leverage adjustment speeds while controlling institutional quality								
Variables	Book leverage adjustment				Market Leverage adjustment			
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	0.00150*** [4.13]	0.00150*** [3.46]	0.000152 [0.67]	0.00144*** [4.56]	0.000706 [1.526]	0.00116*** [2.634]	-0.00792** [-2.045]	0.00153*** [3.283]
<b>Interest rate policy</b>								
Short term IR× DL	0.0626*** [11.09]				0.0659*** [11.947]			
IR Monetary Policy× DL		0.0198*** [5.46]				0.0241*** [13.942]		
IR Lending Rate× DL			0.0265*** [10.98]				0.0158*** [6.828]	
Long term IR × DL				0.0695*** [17.40]				0.0583*** [8.562]
Institutional quality× DL	0.0300*** [21.31]	0.0316*** [17.93]	0.0255*** [18.60]	0.0243*** [17.55]	0.0276*** [18.608]	0.0325*** [17.641]	0.0286*** [20.063]	0.0262*** [15.734]
<b>ESG performances</b>								
ESG× DL	0.292*** [4.31]	0.252*** [3.69]	0.104* [1.72]	0.304*** [4.70]	0.142** [2.394]	0.315*** [4.262]	0.164*** [2.681]	0.215*** [3.182]
<b>Firm control variables</b>								
Accruals quality × DL	0.00804** [2.50]	0.0125*** [3.68]	0.0145*** [4.87]	0.0105*** [3.02]	0.00800** [2.123]	0.0101** [1.969]	0.0113** [2.380]	0.0116*** [2.750]
Profitability × DL	0.0763*** [5.47]	0.0762*** [5.29]	0.0581*** [4.66]	0.0310** [2.09]	0.0895*** [4.783]	0.108*** [5.728]	0.147*** [9.143]	0.125*** [5.539]
Tangibility × DL	0.0100** [2.43]	0.0421*** [5.32]	0.0527*** [7.75]	0.0164*** [4.12]	0.00437 [1.044]	0.0479*** [4.762]	0.0582*** [9.590]	0.00507 [1.019]
Depreciation × DL	-0.0100* [-1.86]	-0.0527*** [-4.37]	-0.0697*** [-7.77]	-0.0120** [-2.24]	-0.00542 [-1.001]	-0.0502*** [-3.471]	-0.0835*** [-8.042]	-0.00938* [-1.647]
Market to Book ratio × DL	2.092*** [4.51]	1.060* [1.91]	1.152** [2.11]	1.685*** [3.36]	0.982* [1.826]	0.951* [1.725]	1.030* [1.875]	0.844 [1.562]
Liquidity × DL	-0.588*** [-12.79]	-0.460*** [-8.14]	-0.428*** [-9.10]	-0.627*** [-14.46]	-0.407*** [-11.697]	-0.551*** [-8.401]	-0.378*** [-8.365]	-0.282*** [-8.137]
Size × DL	-0.0102*** [-5.18]	-0.00889*** [-4.30]	-0.00493*** [-2.79]	-0.00888*** [-5.28]	-0.00529*** [-2.647]	-0.0101*** [-4.203]	-0.00675*** [-3.283]	-0.0110*** [-5.323]
<b>Country characteristics</b>								
Macroprudential policy tightening × DL	0.00876* [1.76]	0.0212*** [4.13]	0.0058 [1.21]	0.0115*** [2.81]	0.0222*** [4.580]	0.0288*** [4.714]	0.00082 [0.153]	0.0210*** [3.883]
GDP growth × DL	-0.0117*** [-3.81]	0.00426 [1.01]	0.00545 [1.41]	-0.0119*** [-4.59]	-0.0235*** [-6.943]	0.00163 [0.358]	0.00316 [0.834]	-0.0190*** [-3.864]
Firm-,Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529
Wald $\chi^2$	1,548***	551***	1,106***	1,037***	730***	1,577***	2,874***	538***
(Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: We test the relationship between ESG performance and leverage adjustment speeds while considering institutional quality. The table presents the results of an FGLS regression analysis:  $\Delta Leverage_{i,j,t+1} = (\beta_{i,j,t} ESG_{i,j,t} + \chi_{i,j,t} IR_{j,t} + \zeta_{i,j,t} Institutional\ quality_{i,j,t} + \phi_{i,j,t} X_{i,j,t}) \times DL_{i,j,t} + \varepsilon_{i,j,t+1}$

The study employs a partial adjustment model, with the dependent variable  $\Delta LEV_{i,j,t+1} = (LEV_{i,j,t+1} - LEV_{i,j,t})$  representing the change in book and market leverage ratio. The leverage deviation from the target (DL) is multiplied by all independent variables. *Institutional quality* is derived as the average of Regulatory quality, Control of Corruption, Voice and Accountability, Political Instability and Violence, Government Effectiveness, and Rule of Law, referring to the method outlined by Kaufmann et al. (2009). The ESG measures a company's ESG performance across three primary dimensions: environmental, social, and governance. Short-term IR is the average interest rate (three-month Treasury) during the year, Long-term IR is the average interest rate (ten-year Treasury) during the year, IR Money policy is the financial interest rates related to money policy, and IR lending rate is the financial interest rates related to lending rate. Each regression considers characteristics at the firm, industry, and country levels, including Accruals quality, Profitability, Tangibility, Depreciation, Market-to-Book ratio, Liquidity, Size, Macroprudential policy tightening, and GDP growth. All variables are defined in Appendix A1. The brackets contain the t-statistics. The asterisks \*\*\*, \*\*, and \* indicate significance levels at 1%, 5%, and 10%, respectively.

**Table 8 (continued)**

Effects of ESG performance and interest rate on leverage adjustment speeds – using interaction term ESG and Institutional quality

Panel B: The joint effect of ESG performance and institutional quality on leverage adjustment speeds								
Variables	Book leverage adjustment				Market Leverage adjustment			
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	0.000273 [0.769]	0.000846* [1.857]	-0.00159*** [-4.606]	0.000251 [0.691]	-0.000894* [-1.889]	0.000139 [0.282]	-0.00236*** [-6.060]	0.000118 [0.247]
<b>Interest rate policy</b>								
Short term IR× DL	0.0525*** [10.151]				0.0518*** [10.352]			
IR Monetary Policy× DL		0.0200*** [5.350]				0.0166*** [3.026]		
IR Lending Rate× DL			0.0220*** [6.929]				0.0184*** [5.522]	
Long term IR × DL				0.0528*** [13.488]				0.0553*** [19.067]
Institutional quality× DL	0.0313*** [20.376]	0.0335*** [18.483]	0.0300*** [17.462]	0.0264*** [19.415]	0.0290*** [18.047]	0.0353*** [17.555]	0.0292*** [15.304]	0.0271*** [16.228]
<b>ESG performances</b>								
ESG× DL	0.623*** [7.741]	0.725*** [7.180]	0.488*** [5.654]	0.648*** [8.475]	0.563*** [7.352]	0.508*** [4.601]	0.565*** [6.456]	0.592*** [8.462]
ESG score×Institutional quality×DL	-0.0140*** [-7.187]	-0.0124*** [-4.188]	-0.0130*** [-5.136]	-0.0135*** [-7.278]	-0.0149*** [-8.121]	-0.0113*** [-3.366]	-0.0135*** [-5.366]	-0.0131*** [-7.190]
<b>Firm control variables</b>								
Accruals quality × DL	0.0107*** [3.418]	0.0262*** [7.020]	0.0143*** [4.587]	0.00818** [2.231]	0.00806** [1.991]	0.0135*** [3.197]	0.00745 [1.363]	0.0151*** [3.694]
Profitability × DL	0.0596*** [4.304]	0.0752*** [4.945]	0.0365*** [2.982]	0.0275* [1.767]	0.0576*** [3.059]	0.115*** [6.826]	0.108*** [5.834]	0.103*** [4.585]
Tangibility × DL	0.00916** [1.984]	0.0464*** [4.769]	0.0284*** [3.518]	0.0118*** [2.825]	0.0102** [2.470]	0.0237** [2.192]	0.0371*** [4.007]	0.00667 [1.366]
Depreciation × DL	-0.00924* [-1.709]	-0.0322** [-2.300]	-0.0397*** [-3.691]	-0.0114** [-2.136]	-0.0113** [-2.108]	-0.00564 [-0.355]	-0.0579*** [-3.976]	-0.0112** [-1.996]
Market to Book ratio × DL	1.903*** [4.075]	1.054* [1.914]	1.131** [2.083]	1.423*** [2.801]	0.951* [1.775]	0.902* [1.659]	1.003* [1.835]	0.828 [1.536]
Liquidity × DL	-0.579*** [-12.368]	-0.332*** [-4.679]	-0.306*** [-6.422]	-0.555*** [-10.664]	-0.386*** [-10.664]	-0.543*** [-10.960]	-0.307*** [-6.367]	-0.00292*** [-9.134]
Size × DL	-0.00647*** [-3.221]	-0.0115*** [-5.598]	-0.00397** [-2.012]	-0.00656*** [-3.878]	-0.00284 [-1.377]	-0.00484** [-2.415]	-0.00469* [-1.922]	-0.00715*** [-3.763]
<b>Country characteristics</b>								
Macroprudential policy tightening × DL	0.00816 [1.615]	0.0256*** [4.213]	0.0150*** [2.615]	0.0168*** [3.609]	0.0278*** [4.710]	0.0149** [2.407]	0.0176** [2.524]	0.0240*** [4.419]
GDP growth × DL	-0.0140*** [-4.305]	0.00338 [0.667]	-0.00706 [-1.508]	-0.0146*** [-5.833]	-0.0233*** [-5.742]	-0.00263 [-0.471]	-0.0116** [-2.526]	-0.0257*** [-6.315]
Firm-, Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529
Wald $\chi^2$	1,379***	1,459***	624***	2,590***	582***	722***	1,381***	5,167***
(Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: The institutional quality moderate the relationship between ESG performance and the speed of leverage adjustment. This table presents the results of an FGLS regression analysis:  $\Delta \text{Leverage}_{i,j,t+1} = (\beta_{i,j,t} \text{ESG}_{i,j,t} + \chi_{i,j,t} \text{Institutional quality}_{i,j,t} + \zeta_{i,j,t} \text{ESG}_{i,j,t} * \text{Institutional quality}_{i,j,t} + \varphi_{i,j,t} X_{i,j,t}) \times \text{DL}_{i,j,t} + \varepsilon_{i,j,t+1}$

The study employs a partial adjustment model, with the dependent variable  $\Delta \text{LEV}_{i,j,t+1} = (\text{LEV}_{i,j,t+1} - \text{LEV}_{i,j,t})$  representing the change in book and market leverage ratio. The leverage deviation from the target (DL) is multiplied by all independent variables. *Institutional quality* is derived as the average of Regulatory quality, Control of Corruption, Voice and Accountability, Political Instability and Violence, Government Effectiveness, and Rule of Law, referring to the method outlined by Kaufmann et al. (2009). The ESG measures a company's ESG performance across three primary dimensions: environmental, social, and governance. Short-term IR is the average interest rate (three-month Treasury) during the year, Long-term IR is the average interest rate (ten-year Treasury) during the year, IR Money policy is the financial interest rates related to money policy, and IR lending rate is the financial interest rates related to lending rate. Each regression considers characteristics at the firm, industry, and country levels, including Accruals quality, Profitability, Tangibility, Depreciation, Market-to-Book ratio, Liquidity, Size, Macroprudential policy tightening, and GDP growth. All variables are defined in Appendix A1. The brackets contain the t-statistics. The asterisks \*\*\*, \*\*, and \* indicate significance levels at 1%, 5%, and 10%, respectively.

**Table 9**  
Effects of ESG performance and interest rate on leverage adjustment speeds –  
using interaction term ESG and Accruals quality

Variables	Book leverage adjustment				Market Leverage adjustment			
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	0.00289*** [26.290]	0.00327*** [8.136]	-0.000378 [-0.929]	0.00277*** [16.202]	0.00302*** [44.875]	0.00601* [-1.255]	0.00171*** [3.323]	0.00297*** [39.783]
<b>Interest rate policy</b>								
Short term IR× DL	0.133*** [35.575]				0.141*** [29.351]			
IR Monetary Policy× DL		0.0326*** [7.026]				0.0397*** [18.205]		
IR Lending Rate× DL			0.0406*** [19.805]				0.0393*** [8.882]	
Long term IR × DL				0.107*** [17.720]				0.101*** [15.173]
<b>ESG performances</b>								
ESG× DL	0.322*** [4.062]	0.244** [2.282]	0.191** [2.225]	0.228*** [2.663]	0.163*** [3.135]	0.220*** [2.665]	0.408*** [4.551]	0.171*** [3.696]
Accruals quality × DL	0.0453*** [7.238]	0.0417*** [4.963]	0.0304*** [4.853]	0.0440*** [5.010]	0.0309*** [6.836]	0.0207*** [3.405]	0.0151*** [4.432]	0.0137** [2.409]
ESG×Accruals quality× DL	-0.747*** [-4.353]	-0.673** [-2.310]	-0.442** [-2.189]	-0.620*** [-2.796]	-0.466*** [-3.730]	-0.390*** [-2.679]	-0.310** [-2.172]	-0.339*** [-2.797]
<b>Firm control variables</b>								
Profitability × DL	0.0224 [1.484]	0.131*** [14.115]	0.0426*** [3.555]	0.100*** [5.111]	0.0870*** [5.538]	0.0797*** [4.723]	0.110*** [6.021]	0.245*** [23.824]
Tangibility × DL	0.0217*** [3.667]	0.000674 [0.073]	0.0123** [2.170]	0.00522 [1.237]	0.00638 [1.509]	0.0119 [1.583]	0.00188 [0.207]	0.0202*** [5.093]
Depreciation × DL	-0.012 [-1.351]	-0.0075 [-0.500]	-0.0272*** [-2.989]	-0.0116** [-2.189]	-0.0187*** [-3.495]	-0.0144 [-1.268]	-0.0156 [-1.250]	-0.0133** [-2.419]
Market to Book ratio × DL	0.862* [1.648]	0.955* [1.791]	0.883* [1.654]	0.694 [1.270]	0.69 [1.347]	0.920* [1.763]	1.041** [1.987]	0.789 [1.529]
Liquidity × DL	0.137*** [3.870]	0.195*** [3.162]	0.281*** [6.546]	-0.0680* [-1.910]	0.216*** [5.291]	-0.0464 [-1.136]	0.102* [1.673]	-0.184*** [-3.821]
Size × DL	-0.0143*** [-9.082]	-0.0131*** [-6.652]	-0.00702*** [-3.630]	-0.00710*** [-4.148]	-0.0106*** [-7.786]	-0.00648*** [-3.670]	-0.0116*** [-5.233]	-0.0155*** [-11.784]
<b>Country characteristics</b>								
Macroprudential policy tightening × DL	0.0245*** [7.293]	0.0223*** [4.130]	0.0229*** [4.035]	0.0131*** [3.136]	0.0398*** [9.552]	0.00917 [1.612]	0.0472*** [8.667]	0.0301*** [6.467]
GDP growth × DL	0.000156 [0.006]	0.0388*** [9.665]	0.0155*** [3.578]	0.0182*** [5.692]	0.00508* [1.676]	0.0169*** [4.838]	0.0232*** [6.013]	-0.00393 [-0.934]
Firm-,Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529
Wald $\chi^2$	15,769***	755***	985***	1,934***	10,724***	582***	508***	15,512***
(Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: The accruals quality moderate the relationship between ESG performance and the speed of leverage adjustment. This table presents the results of an FGLS regression analysis:  $\Delta \text{Leverage}_{i,j,t+1} = (\beta_{i,j,t} \text{ESG}_{i,j,t} + \chi_{i,j,t} \text{Accruals quality}_{i,j,t} + \zeta_{i,j,t} \text{ESG}_{i,j,t} * \text{Accruals quality}_{i,j,t} + \varphi_{i,j,t} X_{i,j,t}) \times \text{DL}_{i,j,t} + \varepsilon_{i,j,t+1}$

The study employs a partial adjustment model, with the dependent variable  $\Delta \text{LEV}_{i,j,t+1} = (\text{LEV}_{i,j,t+1} - \text{LEV}_{i,j,t})$  representing the change in book and market leverage ratio. The leverage deviation from the target (DL) is multiplied by all independent variables. Accruals quality is calculated by assessing the standard deviation of the disparities between actual and predicted company-level values using the model of Dechow and Dichev (2002). The ESG measures a company's ESG performance across three primary dimensions: environmental, social, and governance. Short-term IR is the average interest rate (three-month Treasury) during the year, Long-term IR is the average interest rate (ten-year Treasury) during the year, IR Money policy is the financial interest rates related to money policy, and IR lending rate is the financial interest rates related to lending rate. Each regression considers characteristics at the firm, industry, and country levels, including Accruals quality, Profitability, Tangibility, Depreciation, Market-to-Book ratio, Liquidity, Size, Macroprudential policy tightening, and GDP growth. All variables are defined in Appendix A1. The brackets contain the t-statistics. The asterisks \*\*\*, \*\*, and \* indicate significance levels at 1%, 5%, and 10%, respectively.

**Table 10**  
Effects of ESG pillars and interest rate on leverage adjustment speeds

<b>Panel A: Effects of ESG pillars and interest rate on leverage adjustment speeds (DV= the change in book leverage ratio)</b>												
Variables	<b>Book Leverage adjustment</b>											
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]	[Model 9]	[Model 10]	[Model 11]	[Model 12]
	<i>Short-term interest rate</i>			<i>Interest rate, Monetary policy</i>			<i>Interest rate, Lending rate</i>			<i>Long-term interest rate</i>		
Constant	0.00298*** [27.746]	0.00313*** [25.593]	0.00280*** [18.914]	0.00153*** [3.737]	0.00165*** [3.972]	0.00174*** [3.965]	-0.000166 [-0.424]	-0.00682* [-1.715]	-0.000224 [-0.549]	0.00234*** [11.540]	0.00245*** [16.087]	0.00304*** [18.595]
Environmental score × DL	0.192*** [4.958]			0.339*** [6.309]			0.111** [2.322]			0.296*** [9.068]		
Social score × DL		0.317*** [9.038]			0.376*** [7.395]			0.115*** [2.993]			0.000432*** [11.869]	
Governance score × DL			0.343*** [9.016]			0.136** [2.424]			0.169*** [4.202]			0.000302*** [13.614]
Interest rate	0.0941*** [15.615]	0.134*** [36.939]	0.119*** [20.098]	0.0362*** [6.769]	0.0297*** [6.097]	0.0327*** [7.349]	0.0432*** [15.100]	0.0404*** [15.886]	0.0386*** [17.107]	0.119*** [20.599]	0.117*** [24.932]	0.121*** [21.772]
Accruals quality	0.0167*** [4.587]	0.0326*** [11.423]	0.0277*** [8.912]	0.0196*** [4.669]	0.0291*** [7.080]	0.0159*** [4.187]	0.0241*** [6.778]	0.0240*** [9.058]	0.0148*** [7.392]	0.0336*** [11.938]	0.0356*** [16.049]	0.0322*** [11.613]
Firm control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-, Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529
Wald $\chi^2$	1,872***	18,287***	90,904***	473***	494***	180***	420***	598***	424***	1,279***	4,133***	14,106***
(Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: We test the effect of three pillars of ESG performance impact on the speed of leverage adjustment. The dependent variable is the change in book leverage ratio ( $LEV_{i,j,t+1} - LEV_{i,j,t}$ ). The leverage deviation from the target (DL) is multiplied by all independent variables. The ESG pillars are three ESG primary dimensions: environmental, social, and governance. Short-term IR (Models 1-3) is the average interest rate (three-month Treasury) during the year, Long-term IR (Models 4-6) is the average interest rate (ten-year Treasury) during the year, IR Money policy (Models 7-9) is the financial interest rates related to money policy, and IR lending rate (Models 10-12) is the financial interest rates related to lending rate. All variables are defined in Appendix A1. Standard deviations remain unaffected by heteroskedasticity. The asterisks \*\*\*, \*\*, and \* indicate significance levels at 1%, 5%, and 10%, respectively.

**Table 10 (continued)**  
Effects of ESG pillars and interest rate on leverage adjustment speeds

<b>Panel B: Effects of ESG pillars and interest rate on leverage adjustment speeds (DV= the change in market leverage ratio)</b>												
Variables	Market Leverage adjustment											
	[Model 13]	[Model 14]	[Model 15]	[Model 16]	[Model 17]	[Model 18]	[Model 19]	[Model 20]	[Model 21]	[Model 22]	[Model 23]	[Model 24]
	<i>Short-term interest rate</i>			<i>Interest rate, Monetary policy</i>			<i>Interest rate, Lending rate</i>			<i>Long-term interest rate</i>		
Constant	0.00209*** [8.362]	0.00260*** [10.107]	0.00197*** [6.644]	0.00195*** [5.024]	0.00141*** [3.552]	0.00212*** [4.774]	0.000123 [0.356]	0.000137 [0.349]	0.000242 [0.776]	0.00246*** [22.670]	0.00326*** [45.263]	0.00272*** [26.853]
Environmental score × DL	0.227*** [5.018]			0.337*** [5.834]			0.115** [2.284]			0.208*** [4.235]		
Social score × DL		0.139*** [5.961]			0.476*** [7.822]			0.181*** [3.869]			0.242*** [6.127]	
Governance score × DL			0.251*** [5.859]			0.254*** [5.031]			0.267*** [6.681]			0.175*** [4.048]
Interest rate	0.117*** [17.095]	0.129*** [24.074]	0.116*** [23.420]	0.0332*** [33.955]	0.0341*** [40.905]	0.0369*** [32.228]	0.0359*** [16.648]	0.0347*** [13.597]	0.0423*** [13.957]	0.111*** [15.589]	0.115*** [18.791]	0.104*** [14.850]
Accruals quality	0.0180*** [5.585]	0.0176*** [8.326]	0.0303*** [9.434]	0.00710*** [3.425]	0.00475** [2.514]	0.0190*** [4.777]	0.00991** [2.228]	0.0121*** [2.845]	0.0144*** [3.784]	0.0212*** [7.409]	0.00826** [2.275]	0.0157*** [4.870]
Firm control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-,Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529
Wald $\chi^2$	792***	20,125***	4,380***	6,779***	399,629***	4,162***	501***	305***	676***	3,946***	1,283***	499***
(Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: We test the effect of three pillars of ESG performance impact on the speed of leverage adjustment. The dependent variable is the change in market leverage ratio ( $LEV_{i,j,t+1} - LEV_{i,j,t}$ ). The leverage deviation from the target (DL) is multiplied by all independent variables. The ESG pillars are three ESG primary dimensions: environmental, social, and governance. Short-term IR (Models 1-3) is the average interest rate (three-month Treasury) during the year, Long-term IR (Models 4-6) is the average interest rate (ten-year Treasury) during the year, IR Money policy (Models 7-9) is the financial interest rates related to money policy, and IR lending rate (Models 10-12) is the financial interest rates related to lending rate. All variables are defined in Appendix A1. Standard deviations remain unaffected by heteroskedasticity. The asterisks \*\*\*, \*\*, and \* indicate significance levels at 1%, 5%, and 10%, respectively.



**Table 11**  
Effects of the ESG top 10% and interest rate on leverage adjustment speeds

Variables	Book leverage adjustment				Market Leverage adjustment			
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	0.00316*** [46.129]	0.00163*** [4.081]	0.000465* [0.012]	0.00147*** [6.781]	0.00241*** [13.232]	0.00182*** [4.097]	0.00565* [-0.159]	0.00297*** [33.917]
<b>Interest rate policy</b>								
Short term IR× DL	0.105*** [15.424]				0.119*** [24.984]			
IR Monetary Policy× DL		0.0358*** [7.136]				0.0333*** [28.698]		
IR Lending Rate× DL			0.0501*** [20.844]				0.0356*** [14.403]	
Long term IR × DL				0.124*** [22.062]				0.0993*** [14.316]
<b>ESG performances</b>								
ESG top 10% × DL	0.165** [2.180]	0.295*** [3.176]	0.378*** [4.198]	0.217*** [2.879]	0.209*** [2.637]	0.272*** [2.769]	0.345*** [3.668]	0.179** [2.301]
<b>Firm control variables</b>								
Accruals quality × DL	0.0247*** [7.460]	0.0169*** [4.197]	0.0172*** [9.118]	0.0325*** [11.239]	0.0306*** [9.492]	0.0115*** [3.171]	0.0116** [2.537]	0.0116** [2.412]
Profitability × DL	0.0737*** [4.520]	0.0647*** [5.644]	0.0176 [1.184]	0.0314*** [2.916]	0.0918*** [4.461]	0.134*** [8.453]	0.0885*** [4.807]	0.132*** [6.417]
Tangibility × DL	0.0167*** [3.868]	0.0163 [1.638]	0.0187** [2.520]	0.0112*** [3.155]	-0.00353 [-0.738]	0.0245** [2.469]	0.0200** [2.242]	0.00975** [2.235]
Depreciation × DL	-0.0107* [-1.917]	-0.0229 [-1.443]	-0.0447*** [-3.590]	-0.00603 [-1.175]	-0.0113* [-1.954]	-0.0311* [-1.955]	-0.0314** [-2.219]	-0.00503 [-0.921]
Market to Book ratio × DL	0.897* [1.706]	1.008* [1.910]	0.911* [1.717]	1.013* [1.956]	0.732 [1.414]	1.018* [1.954]	1.016* [1.928]	0.784 [1.512]
Liquidity × DL	-0.125** [-2.288]	0.0182 [0.280]	0.200*** [4.701]	0.0466 [1.352]	0.121*** [3.115]	0.0763 [1.124]	-0.0282 [-0.482]	-0.127*** [-3.323]
Size × DL	-0.00619*** [-5.356]	-0.00173 [-1.007]	-0.00357*** [-2.945]	-0.00289*** [-2.974]	-0.00212* [-1.694]	-0.00516*** [-3.072]	-0.00329** [-2.093]	-0.00846*** [-6.367]
<b>Country characteristics</b>								
Macroprudential policy tightening × DL	0.0265*** [5.853]	0.0237*** [4.529]	0.0180*** [3.791]	0.0224*** [7.098]	0.0197*** [3.820]	0.0437*** [8.404]	0.0179*** [3.169]	0.0443*** [8.527]
GDP growth × DL	0.000233 [0.059]	0.0295*** [6.490]	0.0283*** [7.007]	0.00403 [1.338]	0.00926*** [2.945]	0.0288*** [7.074]	0.0168*** [4.351]	-0.0179*** [-5.594]
Firm-,Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,529	17,529	17,529	17,529	17,529	17,529	17,529	17,529
Wald $\chi^2$	278,121***	324***	3,072***	1,203***	14,038***	4,639***	369***	386***
(Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: We test an analysis to determine if firms with the top 10% ESG performance affect firms' leverage adjustments. The dependent variable is the change in book leverage ratio ( $LEV_{i,j,t+1} - LEV_{i,j,t}$ ). The leverage deviation from the target (DL) is multiplied by all independent variables. ESG top 10% is a binary variable: 1 signifies high ESG performance (top 10%), and 0 signifies low ESG performance. Short-term IR is the average interest rate (three-month Treasury) during the year, Long-term IR is the average interest rate (ten-year Treasury) during the year, IR Money policy is the financial interest rates related to money policy, and IR lending rate is the financial interest rates related to lending rate. All variables are defined in Appendix A1. The brackets contain the t-statistics. The asterisks \*\*\*, \*\*, and \* indicate significance levels at 1%, 5%, and 10%, respectively.

**Table 12**

Effects of the ESG on leverage adjustment speeds after excluding U.S and G7 countries

Panel A: Effects of the ESG on leverage adjustment speeds after excluding U.S

Variables	Book leverage adjustment				Market Leverage adjustment			
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	0.00119*** [3.859]	0.00216*** [4.687]	0.00115** [2.359]	0.00189*** [4.506]	0.00102** [2.328]	0.00192*** [3.551]	0.00171*** [2.975]	0.00658** [1.974]
<b>Interest rate policy</b>								
Short term IR× DL	0.213*** [30.351]				0.189*** [25.942]			
ESG × Short term IR × DL	-0.109*** [-17.739]				-0.0899*** [-13.332]			
IR Monetary Policy×DL		0.0573*** [4.435]				0.0675*** [5.726]		
ESG ×IR Monetary Policy × DL		-0.00841*** [-2.726]				-0.00873*** [-3.027]		
IR Lending Rate× DL			0.0517*** [6.212]				0.0504*** [5.810]	
ESG × IR Lending Rate × DL			-0.00598*** [-3.284]				-0.00534*** [-2.831]	
Long term interest rate×DL				0.209*** [18.160]				0.167*** [11.092]
ESG × Long term IR × DL				-0.0244*** [-9.288]				-0.0174*** [-5.670]
ESG× DL	0.459*** [7.435]	0.396*** [4.531]	0.287*** [3.132]	0.315*** [5.281]	0.491*** [6.843]	0.390*** [4.381]	0.400*** [4.215]	0.418*** [6.008]
Firm control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-,Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,664	10,664	10,664	10,664	10,664	10,664	10,664	10,664
Wald $\chi^2$	1,799***	1,219***	2,244***	1,889***	2,099***	1,160***	2,502***	1,319***
(Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Panel B: Effects of the ESG on leverage adjustment speeds after excluding G7 countries

Variables	Book Leverage adjustment				Market Leverage adjustment			
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	0.00136*** [2.714]	0.00385*** [0.555]	-0.00108*** [-0.294]	0.00150*** [5.040]	0.00169*** [5.964]	-0.00542*** [-0.551]	-0.0075*** [-0.878]	0.00137*** [3.549]
Short term IR× DL	0.205*** [40.205]				0.187*** [14.783]			
ESG × Short term IR × DL	-0.0115*** [-16.329]				-0.0105*** [-13.955]			
IR Monetary Policy×DL		0.0628*** [4.801]				0.0505*** [3.420]		
ESG ×IR Monetary Policy × DL		-0.00129*** [-3.933]				-0.00987*** [-2.734]		
IR Lending Rate× DL			0.0613*** [7.483]				0.0596*** [7.158]	
ESG × IR Lending Rate × DL			-0.00944*** [-5.215]				-0.00916*** [-5.062]	
Long term interest rate×DL				0.201*** [13.505]				0.191*** [10.129]
ESG × Long term IR × DL				-0.00270*** [-8.673]				-0.0265*** [-7.447]
ESG× DL	0.129*** [9.989]	0.120*** [8.176]	0.127*** [9.326]	0.0705*** [4.953]	0.0985*** [6.987]	0.0988*** [5.435]	0.125*** [9.545]	0.0964*** [6.089]
Firm control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-,Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,253	4,253	4,253	4,253	4,253	4,253	4,253	4,253
Wald $\chi^2$	1,799***	1,360***	1,528***	1,693***	1,147***	1,132***	1,233***	1,406***
(Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

**Table 13**

Effects of the ESG and interest rate on leverage adjustment speeds after sample split

Panel A: The effects of ESG on leverage adjustment speeds after separate institutional quality (DV: the change in book leverage ratio)

Variables	High institutional quality				Low institutional quality			
	Dependent variable=Book leverage adjustment							
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	-0.00235*** [-8.585]	0.00393 [1.106]	-0.00574*** [-28.938]	-0.00286*** [-7.044]	0.00696*** [59.123]	0.0112*** [104.055]	0.00648*** [31.417]	0.0135*** [165.482]
Short term IR× DL	0.317*** [29.552]				0.0895*** [10.201]			
ESG × Short term IR × DL	-0.154*** [-6.113]				-0.0340*** [-8.175]			
IR Monetary Policy×DL		0.291*** [10.539]				0.169*** [13.175]		
ESG × IR Monetary Policy × DL		-0.0286*** [-3.520]				-0.0172*** [-9.265]		
IR Lending Rate× DL			0.311*** [43.755]				0.0687*** [16.556]	
ESG × IR Lending Rate × DL			-0.0245*** [-8.533]				-0.00467*** [-5.680]	
Long term interest rate×DL				0.341*** [53.568]				0.276*** [27.771]
ESG × Long term IR × DL				-0.0255*** [-6.926]				-0.0392*** [-25.439]
ESG× DL	0.727*** [12.237]	1.372*** [22.554]	0.909*** [15.368]	0.256*** [4.759]	-0.131*** [-11.022]	-0.228*** [-6.271]	-0.0458 [-1.292]	-0.228*** [-3.973]
Firm control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-,Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,637	7,637	7,637	7,637	5,329	5,329	5,329	5,329
Wald $\chi^2$	25,297***	8,778***	39,740***	17,781***	24,550***	44,891***	6,308***	12,300***
(Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Panel B: The effects of ESG on leverage adjustment speeds after separate institutional quality (DV: the change in market leverage ratio)

Variables	High institutional quality				Low institutional quality			
	Dependent variable=Market leverage adjustment							
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	-0.00210*** [-6.237]	-0.00261*** [-6.326]	-0.00656*** [-28.292]	-0.00353*** [-8.811]	0.00536*** [21.170]	0.00982*** [42.947]	0.00562*** [16.273]	0.0118*** [39.954]
Short term IR× DL	0.257*** [12.519]				0.0798*** [7.478]			
ESG × Short term IR × DL	-0.104*** [-3.753]				-0.0585*** [-6.271]			
IR Monetary Policy×DL		0.346*** [13.834]				0.155*** [10.219]		
ESG ×IR Monetary Policy × DL		-0.0485*** [-5.897]				-0.0155*** [-7.979]		
IR Lending Rate× DL			0.208*** [26.717]				0.0645*** [13.573]	
ESG × IR Lending Rate × DL			-0.0158*** [-4.766]				-0.00552*** [-4.871]	
Long term interest rate×DL				0.283*** [37.584]				0.234*** [18.157]
ESG × Long term IR × DL				-0.0171*** [-4.170]				-0.0304*** [-18.984]
ESG× DL	0.466*** [6.847]	0.802*** [11.423]	0.350*** [4.662]	0.232*** [3.746]	-0.0382 [-0.733]	-0.172*** [-5.530]	-0.244*** [-5.521]	-0.149*** [-4.978]
Firm control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-,Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,637	7,637	7,637	7,637	5,329	5,329	5,329	5,329
Wald $\chi^2$	12,014***	16,572***	18,109***	7,560***	10,811***	13,493***	17,082***	7,297***
(Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

This table tests the relationship between ESG performance and the speed of leverage adjustment after splitting observation in countries with high institutional quality (Models 1-4) and low institutional quality (Models 5-8). In panel A, the dependent variable represents the change in book leverage ratio. In panel B, the dependent variable is the change in market leverage ratio. The leverage deviation from the target (DL) is multiplied by all independent variables. Tightening refers to the difference between reported tightening and loosening percentages. The ESG measures a company's ESG performance across three primary dimensions: environmental, social, and governance. Short-term IR is the average interest rate (three-month Treasury) during the year, Long-term IR is the average interest rate (ten-year Treasury) during the year, IR Money policy is the financial interest rates related to money policy, and IR lending rate is the financial interest rates related to lending rate. All variables are defined in Appendix A1. The brackets contain the t-statistics. The asterisks \*\*\*, \*\*, and \* indicate significance levels at 1%, 5%, and 10%, respectively.

**Table 14**

Effects of the ESG and tightening policy on leverage adjustment speeds

Variabes	Book leverage adjustment				Market Leverage adjustment			
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	0.00658*** [0.734]	-0.00184*** [-0.217]	0.00579*** [0.656]	0.00207*** [0.251]	0.00638*** [0.685]	0.00302*** [0.333]	0.00402*** [0.429]	0.00528*** [0.558]
Tightening × DL	0.139*** [5.147]	0.180*** [7.084]	0.133*** [4.924]	0.115*** [4.385]	0.130*** [4.801]	0.151*** [5.700]	0.125*** [4.278]	0.102*** [3.601]
ESG × DL	0.774*** [4.420]	0.675*** [3.967]	0.606*** [4.037]	0.561*** [3.719]	0.787*** [4.090]	0.753*** [3.965]	0.697*** [4.070]	0.673*** [3.842]
Short term IR × DL	0.114*** [5.605]				0.112*** [4.995]			
IR Monetary Policy × DL		0.0818*** [3.605]				0.0922*** [3.561]		
IR Lending Rate × DL			0.128*** [16.170]				0.119*** [13.008]	
Long term interest rate × DL				0.183*** [11.867]				0.163*** [8.776]
Firm control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-, Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,865	6,865	6,865	6,865	6,865	6,865	6,865	6,865
Wald $\chi^2$	161***	194***	399***	220***	189***	189***	269***	189***
(Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: We investigate the correlation between ESG performance and leverage adjustment speeds while controlling tightening policy in U.S. The table presents the results of an FGLS regression analysis:  $\Delta \text{Leverage}_{i,j,t} = (\beta_{i,j,t} \text{ESG}_{i,j,t} + \gamma_{i,j,t} \text{IR}_{j,t} + \zeta_{i,j,t} \text{Tightening}_{j,t} + \varphi_{i,j,t} X_{i,j,t}) \times \text{DL}_{i,j,t} + \varepsilon_{i,j,t}$ . The study employs a partial adjustment model, with the dependent variable representing the change in book and market leverage ratio ( $LEV_{i,j,t+1} - LEV_{i,j,t}$ ). The leverage deviation from the target (DL) is multiplied by all independent variables. Tightening refers to the difference between reported tightening and loosening percentages. The ESG measures a company's ESG performance across three primary dimensions: environmental, social, and governance. Short-term IR is the average interest rate (three-month Treasury) during the year, Long-term IR is the average interest rate (ten-year Treasury) during the year, IR Money policy is the financial interest rates related to money policy, and IR lending rate is the financial interest rates related to lending rate. All variables are defined in Appendix A1. The brackets contain the t-statistics. The asterisks \*\*\*, \*\*, and \* indicate significance levels at 1%, 5%, and 10%, respectively.

**Table 15**

Effects of the ESG and tightening policy on leverage adjustment speeds

Variables	Book Leverage adjustment				Market leverage adjustment			
	[Model 1]	[Model 2]	[Model 3]	[Model 4]	[Model 5]	[Model 6]	[Model 7]	[Model 8]
Constant	0.00833*** [0.971]	0.0082*** [0.954]	0.00539*** [0.650]	-0.00439*** [-0.569]	0.00571*** [0.622]	0.00594*** [0.643]	-0.00416*** [-0.476]	-0.00462*** [-0.518]
Tightening × DL	0.0172*** [5.420]	0.0190*** [6.019]	0.0219*** [7.067]	0.0133*** [5.040]	0.0163*** [4.832]	0.0183*** [5.441]	0.0169*** [5.247]	0.0135*** [4.097]
ESG × DL	0.735*** [4.394]	0.769*** [4.641]	0.801*** [5.457]	0.403*** [3.588]	0.789*** [4.308]	0.865*** [4.810]	0.934*** [6.148]	0.756*** [4.534]
ESG top 10% × Tightening × DL	0.0883*** [4.400]	0.117*** [5.093]	0.0535*** [2.664]	0.0473*** [4.304]	0.0703* [1.894]	0.0939*** [2.604]	0.0622** [2.298]	0.0786** [2.251]
ESG bottom 10% × Tightening × DL	-0.0135*** [-2.838]	-0.0142*** [-2.991]	-0.0208*** [-4.887]	-0.0110*** [-3.028]	-0.0155*** [-2.856]	-0.0164*** [-2.992]	-0.0161*** [-3.336]	-0.0128** [-2.471]
Short term IR × DL	0.103*** [5.086]				0.101*** [4.610]			
IR Monetary Policy × DL		0.0759*** [3.308]				0.0747*** [3.014]		
IR Lending Rate × DL			0.124*** [16.299]				0.118*** [15.996]	
Long term interest rate × DL				0.178*** [12.707]				0.158*** [9.409]
Firm control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-, Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,865	6,865	6,865	6,865	6,865	6,865	6,865	6,865
Wald $\chi^2$	182***	251***	564***	280***	150***	237***	654***	221***
(Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: The Tightening moderates the relationship between ESG top 10% (bottom 10%) performance and the speed of leverage adjustment.

This table presents the results of an FGLS regression analysis:

$$\Delta \text{Leverage}_{i,j,t} = (\beta_{i,j,t} \text{ESG}_{i,j,t} + \chi_{i,j,t} \text{IR}_{j,t} + \zeta_{i,j,t} \text{Tightening}_{j,t} + \alpha_{i,j,t} \text{ESG top 10\%}_{i,j,t} \times \text{Tightening}_{j,t} + \phi_{i,j,t} \text{ESG bottom 10\%}_{i,j,t} \times \text{Tightening}_{j,t} + \varphi_{i,j,t} X_{i,j,t}) \times \text{DL}_{i,j,t} + \varepsilon_{i,j,t}$$

The study employs a partial adjustment model, with the dependent variable representing the change in book and market leverage ratio ( $LEV_{i,j,t+1} - LEV_{i,j,t}$ ). The leverage deviation from the target (DL) is multiplied by all independent variables. Tightening refers to the difference between reported tightening and loosening percentages. The ESG measures a company's ESG performance across three primary dimensions: environmental, social, and governance. Short-term IR is the average interest rate (three-month Treasury) during the year, Long-term IR is the average interest rate (ten-year Treasury) during the year, IR Money policy is the financial interest rates related to money policy, and IR lending rate is the financial interest rates related to lending rate. All variables are defined in Appendix A1. The brackets contain the t-statistics. The asterisks \*\*\*, \*\*, and \* indicate significance levels at 1%, 5%, and 10%, respectively.

## Appendix A1

### Variables definition and expected sign

Abbreviation	Variables	Description	Prior research	Data Source	Expected sign
<i>Panel A: Firm-level variables</i>					
<i>A1. Firm leverage</i>					
Book leverage	Book leverage	Book leverage is defined as the ratio of total book debt to total book assets; Total debt = Long term debt + Short term debt	(Demirci et al., 2019, Im et al., 2022, Yang et al., 2023)	Thomson Reuters ESG database; manually calculated by authors	
Market leverage	Market leverage	Market value of liabilities / Market value of assets; Market value of assets = Market value of common equity + Total assets – Common equity – Deferred taxes; Market value of liabilities = Total assets – Common equity – Deferred taxes	(Demirci et al., 2019, Yang et al., 2023)	Thomson Reuters ESG database; manually calculated by authors	
Target leverage	Target leverage	Estimated from the regression of observed leverage on the firm-specific variables and risk measures		Self calculated	
DL	Distance leverage	Difference between target and observed leverage ratio		Self calculated	
<b>A2. ESG performance</b>					
ESG	ESG scores	ESG score that measures firm's ESG performance across three pillars (environment (E), social (S), and governance (G)) and ten topics (resource use, emissions, innovation, management, shareholders, CSR strategy, workforce, human rights, community, and product responsibility)	(Do et al., 2023, Ho et al., 2021a, Yang et al., 2018)	Thomson Reuters ESG database	(+)
Environment score	Environment pillar scores	The average of resource use, emissions, and environmental innovation scores.	(Do et al., 2023, Ho et al., 2021a, Yang et al., 2018)	Thomson Reuters ESG database	(+)
Social score	Social pillar scores	The average of workforce, human rights, community, and product responsibility scores.	(Do et al., 2023, Ho et al., 2021a, Yang et al., 2018)	Thomson Reuters ESG database	(+)
Governance score	Governance pillar scores	The average of management, shareholders, and CSR strategy scores.	(Do et al., 2023, Ho et al., 2021a, Yang et al., 2018)	Thomson Reuters ESG database	(+)
<b>A3. Other firm-level characteristics</b>					
Tangibility	Tangibility	<i>Tangibility</i> is defined as the ratio between the value of PPE and total assets. Net property, plant, and equipment / Total assets	(Demirci et al., 2019, Ho et al., 2021a, Im et al., 2022, Yang et al., 2023)	Thomson Reuters ESG database; manually calculated by authors	(+)
Size	Size	Natural logarithm of total book value of sales (in millions of US dollars)	(Ho et al., 2021a, Yang et al., 2023)	Thomson Reuters ESG database; manually calculated by authors	(-)
Profitability	Profitability	<i>ROA</i> is defined as operating income scaled by total assets.	(Demirci et al., 2019, Ho et al., 2021a, Im et al., 2022)	Thomson Reuters ESG database; manually calculated by authors	(-)
Market to Book ratio	Market to Book ratio	<i>Market-to-book</i> is defined as the ratio between the market value of total assets and the book value of the firm.	(Do et al., 2023, Im et al., 2022)	Thomson Reuters ESG database; manually calculated by authors	(+)
Depreciation	Depreciation	Depreciation and amortization divided by total assets.	(Ho et al., 2021a, Im et al., 2022, Yang et al., 2023)	Thomson Reuters ESG database; manually calculated by authors	(-)

Abbreviation	Variables	Description	Prior research	Data Source	Expected sign
Accruals quality	Accruals quality	<i>Accruals quality</i> : is calculated by taking the standard deviation of the differences between actual and predicted values at the company level, based on a statistical model developed by Dechow and Dichev in 2002. This model uses regression analysis to compare a company's working capital accruals with past, present, and future cash flows and changes in revenue and property, plant, and equipment (PPE). These variables are divided by the firm's average total assets, and the resulting value is multiplied by a negative one.	(Dufour et al., 2020, Yang et al., 2023)	Thomson Reuters ESG database; manually calculated by authors	(+)
Liquidity	Liquidity	Liquidity is calculated by taking current assets divided by total assets	(Huang et al., 2021)	Thomson Reuters ESG database; manually calculated by authors	(+)
<b>Panel B: Country characteristics (Country-level variables)</b>					
Macroprudential policy tightening	Macroprudential policy tightening	Macroprudential policy index by Alam et al. (2019) from the integrated Macroprudential Policy (iMaPP) database	(Yang et al., 2023)	International Monetary Fund (IMF)	(+)
GDP growth	GDP growth	Annual GDP growth rate (%)	(Çolak et al., 2018, Cook et al., 2010, Ho et al., 2021a)	World Development Indicator	(+)
Short-term IR	Short-term interest rate level	The average interest rate (three-month Treasury) during the year, measured as a percentage	(Demirci et al., 2019, Huang et al., 2009, Lemmon et al., 2010)	OECD data	(+)
Long-term IR	Long-term interest rate level	The average interest rate (ten-year Treasury) during the year, measured as a percentage	(Demirci et al., 2019, Huang et al., 2009, Lemmon et al., 2010)	OECD data	(+)
IR Money policy	Interest Rates, Money policy	Financial, Interest Rates, Money Policy (%)	(Demirci et al., 2019, Huang et al., 2009, Lemmon et al., 2010)	IMF data International Financial Statistics	(+)
IR lending rate	Interest Rates, lending rate	Financial, Interest Rates, Lending Rate (%)	(Demirci et al., 2019, Huang et al., 2009, Lemmon et al., 2010)	IMF data International Financial Statistics	(+)
Negative IR policy	Negative Interest Rates policy	Takes the value of one if a negative Interest Rates policy is implemented, and zero otherwise		OECD data	(+)
Institutional quality	Institutional quality	The institutional quality index is computed as a simple average of the six indicators developed by Kaufmann et al. (2009). Six indexes include (1) Regulatory quality; (2) Control of Corruption; (3) Voice and Accountability, (4) Political Instability and Violence; (5) Government Effectiveness; and (6) Rule of Law. Furthermore, data collected from available online at <a href="http://info.worldbank.org/governance/wgi/">http://info.worldbank.org/governance/wgi/</a>	(Çolak et al., 2018, Ho et al., 2021a, Öztekin et al., 2012)	Worldwide Governance Indicators (WGI), compiled by Kaufmann et al. (2008)	(+)
Tightening	Tightening	Tightening refers to the difference between reported tightening and loosening percentages. Positive values signify tighter standards, while negative values imply loosening. To access Federal Reserve data, visit <a href="https://www.federalreserve.gov/datadownload/Build.aspx?rel=SLOOS">https://www.federalreserve.gov/datadownload/Build.aspx?rel=SLOOS</a> . The annual tightening measure is calculated by averaging the current quarter and the three preceding quarters.	(Edwards et al., 2016)	The Federal Reserve System	(+)



## Appendix A.2

### Table 1

#### Target leverage estimation result

This table presents the results of the dynamic panel data regression model for estimating both the target book and market leverage ratios. The equation is:

$$\text{Leverage}_{i,j,t+1} = (\eta\delta)X_{i,j,t} + (1-\eta)\text{Leverage}_{i,j,t} + \varepsilon_{i,j,t+1}$$

We employ the FGLS methodology for model estimation (with standard errors in parentheses). Variable definitions are available in Appendix A1. Symbols \*, \*\*, and \*\*\* denote significance levels of 10%, 5%, and 1%, respectively.

Variables	(Book Leverage) <sub>i,t+1</sub>	(Market Leverage) <sub>i,t+1</sub>
	Model 1	Model 2
Constant	0.00892** [2.397]	-0.0439*** [-10.505]
Book leverage	0.942*** [65.645]	
Market leverage		0.931*** [53.084]
ESG score	0.442*** [3.743]	0.745*** [4.325]
Accruals quality	0.0185*** [2.940]	-0.0345*** [-13.161]
Profitability	0.0226*** [7.419]	0.0428*** [14.927]
Tangibility	0.0261*** [3.537]	0.0281** [2.308]
Depreciation	-0.0285*** [-3.164]	-0.0347** [-2.348]
Market to Book ratio	0.181 [1.462]	-0.0474 [-0.297]
Macprudential policy tightening	0.0763*** [7.990]	0.263*** [21.814]
Liquidity	-0.183*** [-20.112]	-0.128*** [-18.738]
Size	0.0316* [1.800]	0.254*** [12.425]
GDP growth	-0.0802*** [-14.380]	-0.219*** [-35.067]
Number of observations	17,529	17,529
Number of firms	1,960	1,960
Wald $\chi^2$ (Prob > $\chi^2$ )	66,886 0.000	87,881 0.000

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