

Evolution of Greenium. ESG and the Cost of Equity in the Polish Banking Sector

Katarzyna Perez

Poznan University of Economics and Business, Poland

e-mail: katarzyna.perez@ue.poznan.pl

ORCID: [0000-0003-3331-8456](https://orcid.org/0000-0003-3331-8456)

Alan Celmerowski

Poznan University of Economics and Business, Poland

e-mail: AlanCelmerowski@gmail.com

ORCID: [0009-0001-0338-1860](https://orcid.org/0009-0001-0338-1860)

Tomasz Gabrusewicz

Poznan University of Economics and Business, Poland

e-mail: tomasz.gabrusewicz@ue.poznan.pl

ORCID: [0000-0001-5017-6926](https://orcid.org/0000-0001-5017-6926)

© 2026 Katarzyna Perez, Alan Celmerowski, Tomasz Gabrusewicz

This work is licensed under the Creative Commons Attribution-ShareAlike 4.0 International License.
To view a copy of this license, visit <http://creativecommons.org/licenses/by-sa/4.0/>

Quote as: Perez, K., Celmerowski, A., & Gabrusewicz, T. (2026). Evolution of Greenium. ESG and the Cost of Equity in the Polish Banking Sector. *Financial Sciences*, 31(1), 15-30.

DOI: [10.15611/fins.2026.1.02](https://doi.org/10.15611/fins.2026.1.02)

JEL: G21, G32, Q56

Abstract

Aim: The aim of the study was to examine the impact of Environmental, Social, and Governance (ESG) performance on the cost of equity of commercial banks listed on the Warsaw Stock Exchange, with particular emphasis on the role of individual ESG pillars. Specifically, the study investigated how this relationship dynamically evolves across distinct phases of the energy transition in Poland.

Methodology: The empirical analysis was based on panel data covering the period 2012–2024. The cost of equity was estimated using the Capital Asset Pricing Model (CAPM). A two-way fixed effects model with Driscoll-Kraay standard errors was applied, while ESG variables were lagged by one period to mitigate endogeneity concerns. The static baseline specification was extended to include a phase-interaction framework to capture time-varying transition risks.

Findings: The static baseline results did not confirm a classical ‘greenium’ for the aggregate ESG score, however an ‘inverted greenium’ was observed specifically within the Social pillar. Furthermore, the dynamic phase-based analysis uncovered a significant structural shift in ESG pricing. The market's assessment evolved from initial indifference (2012–2014), through a period of penalisation where ESG was perceived as a costly burden (2015–2021), to the materialisation of a statistically significant greenium in the most recent, high-intensity energy transition phase (2022–2024).

Implications: The findings demonstrate that the financial benefits of ESG engagement in transition-intensive emerging markets are not immediate. Investor perception of sustainability shifts dynamically, from initial indifference, through a compliance cost, to a risk-mitigating asset, depending on the maturity of the regulatory environment and the escalating pressures of the energy transition. This suggests that realizing the financial benefits of ESG investments may require a longer-term strategic perspective.

Originality/value: This paper significantly contributes to the literature by demonstrating the non-linear, time-varying nature of ESG pricing in the banking sector. It provides novel empirical evidence on how context-dependent structural constraints and energy transition risks shape the delayed emergence of a greenium in one of the Central and Eastern European markets.

Keywords: greenium, ESG, cost of equity, banking sector, sustainable finance

1. Introduction

The growing importance of sustainable finance has significantly transformed modern capital markets, reshaping how investors evaluate corporate risk and value. In this context, Environmental, Social, and Governance (ESG) factors have become an integral component of investment decision-making. A substantial body of literature suggests that companies with superior ESG performance may benefit from a lower cost of capital, commonly referred to as a ‘greenium’, reflecting reduced risk and improved transparency.

However, the empirical evidence on the ESG/cost of capital relationship remains inconclusive. While many studies document a negative association, indicating that sustainability reduces financing costs, more recent research has highlighted the context-dependent nature of this relationship. In particular, the benefits of ESG integration may be offset by the costs of implementation, regulatory burdens, and transition risks, especially in sectors and regions characterized by structural constraints.

These ambiguities are particularly pronounced in the banking sector. As highly regulated financial intermediaries, banks operate under strict supervisory frameworks, and their risk profile is influenced not only by internal governance but also by macroeconomic conditions and systemic factors. Moreover, banks play a pivotal role in financing the real economy, including carbon-intensive industries, which makes the environmental dimension of ESG especially complex in this sector. At the same time, the social dimension – related to customer protection, employee relations, and broader stakeholder engagement – may generate significant operational costs that are not immediately reflected in financial performance.

The Polish banking sector provides a unique setting to examine these dynamics. Although Poland has been classified as a developed market by FTSE Russell, its economy remains heavily dependent on coal, creating significant challenges related to the energy transition. In the banking sector, this creates a unique ‘transition risk channel’ where transition costs, driven by high CAPEX requirements for energy-intensive clients and increasing regulatory pressures (EU Taxonomy, CSRD), are internalised by investors as systemic risks (Gajdzik et al., 2026). In this context, ESG performance is not merely an ethical signal but a proxy for a bank’s ability to manage ‘stranded assets’ and credit risk volatility. At the same time, Polish banks operate in a demanding regulatory environment, characterised by sector-

-specific taxes, credit holidays, and substantial legacy risks associated with foreign currency mortgage portfolios. Consequently, investors may demand a higher risk premium for banks with lower ESG scores to compensate for the potential impact of carbon-related defaults on the bank's future cash flows and capital adequacy.

Despite the growing interest in sustainable finance, empirical evidence on the relationship between ESG performance and the cost of equity in Central and Eastern European (CEE) countries remains limited. In particular there is a lack of studies focusing on the banking sector and accounting for country-specific structural risks. This creates a research gap concerning whether ESG factors are effectively priced by investors in such environments, or whether traditional financial fundamentals and systemic risks dominate the cost of capital.

Therefore the primary aim of this study was to examine the impact of ESG performance on the cost of equity of commercial banks listed on the Warsaw Stock Exchange. The analysis focuses not only on the aggregate ESG score but also on its individual components – Environmental, Social, and Governance – in order to identify their relative importance in shaping investors' required returns. To achieve this objective, the study employed a panel data approach using a two-way fixed effects model covering the period from 2012 to 2024. This methodological framework allowed for controlling both for unobservable bank-specific characteristics and time-specific effects, ensuring robust estimation results.

The contribution of this study is fourfold. First, it provides new empirical evidence on the ESG-cost of equity relationship in an underexplored emerging European market. Second, it focuses on the banking sector, where the role of ESG remains ambiguous and insufficiently examined. Third, it offers insights into the possibility of an 'inverted greenium', particularly with respect to the social dimension. Finally, it introduces a temporal dimension to the ESG-cost of equity capital debate by demonstrating how the pricing of sustainability evolves dynamically across distinct macroeconomic and regulatory phases, directly addressing the gap in understanding time-varying transition risks.

The remainder of the paper is structured as follows: Section 2 reviews the relevant literature and develops the research hypotheses, Section 3 presents the data and methodology, and Section 4 the empirical results, whilst Section 5 discusses them, and Section 6 concludes the paper.

2. Literature Review and Hypotheses Formulation

The growing importance of sustainable finance has led to an increasing interest in the relationship between Environmental, Social, and Governance (ESG) factors and the cost of capital. Within the classical framework of financial theory, the required rate of return reflects the perceived risk associated with an investment. Consequently, any factor that reduces uncertainty, improves transparency, or mitigates risk should, in principle, lead to a lower cost of capital (Lintner, 1965; Modigliani & Miller, 1958; Sharpe, 1964).

In this context, ESG performance is often interpreted as a proxy for non-financial risk management. Companies with higher ESG ratings are expected to exhibit lower exposure to regulatory penalties, reputational damage, and operational disruptions. Empirical evidence supports this view. El Ghouli et al. (2011) demonstrated that businesses with superior corporate social responsibility profiles benefit from a significantly lower cost of equity. Similarly, Dhaliwal et al. (2011) found that voluntary disclosure of non-financial information contributes to reducing the cost of equity by decreasing information asymmetry. Chava (2014) further showed that environmental risk is explicitly priced by investors, with companies exhibiting poor environmental performance facing higher expected returns. More recent evidence confirmed these mechanisms across different markets, including emerging economies and Asia-Pacific countries, where ESG performance was found to reduce financing costs through enhanced transparency and stakeholder trust (Chen et al., 2023; Mohammad et al., 2023).

From a theoretical perspective, these findings underpin the concept of a greenium, defined as a lower required rate of return for firms with strong ESG performance (Zerbib, 2019). Broad empirical syntheses such as the meta-analysis conducted by Friede et al. (2015), confirm that the relationship between ESG and financial performance is predominantly non-negative, with a significant share of studies indicating a beneficial impact. However, recent contributions stress that this effect may differ across ESG pillars and institutional settings, with some studies identifying stronger effects for environmental factors compared to social or governance dimensions (Azmi et al., 2021).

Apart from not being uniform, the ESG-cost of capital relationship is not stable over time. Pástor et al. (2021) argued that while investor preferences for sustainable assets may reduce expected returns, the transition towards sustainability entails substantial costs that can offset these benefits in the short term. This highlights the dynamic nature of ESG pricing, where the balance between preferences and transition risks may shift across different periods. At the same time, ESG-related risks remain an important channel through which sustainability is priced. Hampl and Vágnerová Linnertová (2024) showed that ESG controversies can increase the cost of capital, while the literature on carbon risk indicates that investors demand a premium for holding carbon-intensive assets (cf. Bolton & Kacperczyk, 2021). Moreover, the transition towards low-carbon activities may itself be perceived as financially burdensome, further complicating the relationship, and these effects appear to be particularly pronounced in emerging markets. Empirical evidence suggests that ESG activities may in some cases, increase the cost of capital, particularly when they are perceived as costly, uncertain or driven by regulatory pressure (Mohammad et al., 2023). In line with this, recent studies highlighted that ESG-related investments may generate short-term financial pressures in transitioning economies, reinforcing the notion of time-varying and non-linear effects (Wong et al., 2024).

These mixed findings suggest that the impact of ESG on the cost of capital is context-dependent and may vary across sectors and institutional environments. In particular the banking sector represents a specific case due to its regulatory intensity and systemic importance. Banks operate under strict supervisory frameworks, and their risk profile is influenced not only by internal governance but also by macroprudential regulations and market-wide shocks.

Existing studies indicate that ESG factors play a distinct role in banking. Goss and Roberts (2011) revealed that companies with weaker CSR performance face higher borrowing costs, indicating that lenders incorporate non-financial risk into pricing decisions. In the context of banks, however, ESG activities may be driven more by regulatory compliance than by voluntary value creation. Empirical evidence suggests that ESG performance is associated with financial stability (Bătae et al., 2020; Tóth et al., 2021), although its direct impact on the cost of equity remains ambiguous. Notably, the governance dimension is often considered the most relevant for financial institutions as it directly relates to risk management quality and regulatory compliance (López-Penabad et al., 2023).

The heterogeneity of results becomes even more pronounced in emerging markets. In such economies, ESG integration is often at an earlier stage of development, and institutional frameworks may limit the effectiveness of ESG signals. Mohammad et al. (2023) found that ESG disclosure can reduce the cost of capital in emerging markets, although the effect is weaker and less consistent than in developed economies. Studies focusing on Central and Eastern Europe (CEE) indicated that ESG performance is associated with financial outcomes, but the relationship is highly dependent on country-specific conditions (Buła et al., 2024; Siwiec & Karkowska, 2024). In many cases, ESG activities are perceived primarily as a regulatory requirement rather than a source of competitive advantage (Bryl, 2026).

This issue is particularly relevant in the Polish context. The domestic banking sector operates within a unique macroeconomic and regulatory environment, characterised by a high reliance on carbon-intensive industries, significant regulatory burdens, and substantial legacy risks, including those associated with foreign currency mortgage portfolios. These structural factors may overshadow the potential benefits of ESG integration and influence how investors price sustainability-related information.

Given the theoretical foundations suggesting a negative relationship between ESG performance and the cost of equity, as well as the mixed empirical evidence from emerging markets highlighting transition costs, the authors posit that this relationship is not static. Instead, the market pricing of ESG evolves as regulatory and macroeconomic pressures intensify, therefore the following hypothesis was formulated:

H1. *Dynamic Greenium Hypothesis*: The negative relationship between the aggregate ESG score and the cost of equity is time-varying and materialises in the advanced phases of regulatory pressure and energy transition.

The literature also indicates that the relevance of individual ESG pillars may differ across sectors. In the banking industry, governance mechanisms play a key role due to their direct impact on risk control, regulatory compliance, and managerial quality. Empirical studies suggest that strong governance structures can reduce perceived risk and enhance investor confidence (Bătae et al., 2020; López-Penabad et al., 2023). Hence, it is expected that the governance dimension exerts the strongest influence on the cost of equity:

H2. *Governance Dominance Hypothesis*: The Governance pillar has the strongest negative impact on the cost of equity of commercial banks.

Next, considering the specific characteristics of emerging markets and the structural conditions of the Polish economy, the environmental dimension may be perceived differently by investors. In economies with a high dependence on carbon-intensive sectors, environmental transition efforts may generate significant costs and uncertainty. As a result, ESG-related investments – particularly those related to environmental performance – may not be immediately rewarded by the market. This leads to the formulation of the following hypothesis:

H3. *Environmental Neutrality Hypothesis*: The Environmental pillar does not significantly reduce the cost of equity in commercial banks.

Finally, taking into account the potentially cost-intensive nature of social engagement, particularly in regulated banking environments, the social dimension is likely to be treated by the market as a persistent operational burden, therefore the following hypothesis was formulated:

H4. *Social Cost Hypothesis*: The Social pillar is positively associated with the cost of equity of commercial banks.

3. Methodology

3.1. Sample and Data Collection

The empirical analysis is based on a data panel of commercial banks listed on the Warsaw Stock Exchange (WSE), and the research covered the period 2012 to 2024, capturing a significant timeframe of evolving ESG reporting standards and macroeconomic turbulence in Poland.

Data concerning market quotations and financial fundamentals, necessary to calculate the cost of equity (COE) and control variables, were sourced from the Stooq.pl, Refinitiv (LSEG Workspace), EMIS and Damodaran databases. The ESG ratings, serving as the primary independent variables, were also obtained from Refinitiv, which provides a comprehensive breakdown of the aggregate score into Environmental (E), Social (S), and Governance (G) pillars.

The initial research sample consisted of ten commercial banks listed on the WSE (namely: Alior Bank S.A. (ALR), Bank Handlowy w Warszawie S.A. (BHW), BNP Paribas Bank Polska S.A. (BNP), Bank Ochrony Środowiska S.A. (BOS), ING Bank Śląski S.A. (ING), mBank S.A. (MBK), Bank Millennium S.A. (MIL), Bank Pekao S.A. (PEO), PKO Bank Polski S.A. (PKO), Santander Bank Polska S.A. (SPL)). During the data preparation phase, BOS and BNP were excluded from the sample due to substantial missing historical

ESG data specific to its Polish operations. Thus the final sample comprised eight banks, which collectively represent the core of the Polish banking sector. As of the end of the research period of 2024, their average market capitalisation amounted to PLN 28.6 billion (around EUR 6,75 bn). The sample was characterised by a substantial financial scale and strong profitability, with an average net profit of PLN 4.1 billion and an average Return on Equity (ROE) of 17.4%. Asset quality also remained relatively solid, reflected by an average Non-Performing Loans (NPL) ratio of 3.73%.

After defining the final sample, observations containing missing values were omitted (listwise deletion) to ensure a balanced and robust panel dataset, resulting in a final panel of $N = 90$ observations. To mitigate the risk of endogeneity and the 'look-ahead bias', all independent ESG variables were lagged by one year ($t - 1$), reflecting the reality that investors price capital based on the previous year's published non-financial reports.

3.2. Variables and Model Specification

The dependent variable in this study was the **Cost of Equity** (COE), estimated using the Capital Asset Pricing Model (CAPM), expressed by the following equation:

$$COE_{i,t} = R_{f,t} + \beta_{i,t} * ERP_t ,$$

where $COE_{i,t}$ is the cost of equity for bank i in year t , $R_{f,t}$ is the risk-free rate, $\beta_{i,t}$ represents the systematic risk of the bank, and ERP_t is the market equity risk premium.

The CAPM was parameterised using the yield on 10-year Polish Treasury bonds as the risk-free rate, a standard three-year historical beta for each bank, and the Equity Risk Premium (ERP) was sourced from Damodaran's database. The independent variables of interest were the one-year lagged aggregate ESG score (ESG_lag) and its individual pillars (E_lag, S_lag, G_lag).

To isolate the effect of ESG factors, a set of fundamental control variables specific to the banking sector was introduced:

1. **Size:** The natural logarithm of total assets.
2. **Return on Equity (ROE):** Measuring profitability.
3. **Leverage:** A measure of capital structure risk, defined as the ratio of total assets to total equity.
4. **NPL (Non-Performing Loans) Ratio:** The ratio of impaired loans of total loans, serving as a proxy for direct credit risk.

Four variants of the baseline regression model were formulated to test the respective impacts:

1. $COE_{i,t} = \alpha + \beta_1 ESG_lag_{i,t-1} + \beta_2 Size_{i,t} + \beta_3 ROE_{i,t} + \beta_4 Leverage_{i,t} + \beta_5 NPL_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$
2. $COE_{i,t} = \alpha + \beta_1 E_lag_{i,t-1} + \beta_2 Size_{i,t} + \beta_3 ROE_{i,t} + \beta_4 Leverage_{i,t} + \beta_5 NPL_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$
3. $COE_{i,t} = \alpha + \beta_1 S_lag_{i,t-1} + \beta_2 Size_{i,t} + \beta_3 ROE_{i,t} + \beta_4 Leverage_{i,t} + \beta_5 NPL_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$
4. $COE_{i,t} = \alpha + \beta_1 G_lag_{i,t-1} + \beta_2 Size_{i,t} + \beta_3 ROE_{i,t} + \beta_4 Leverage_{i,t} + \beta_5 NPL_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$

where μ_i represents unobservable bank-specific individual effects, and λ_t captures time-specific effects.

The four variants of the baseline model were specifically designed to test the formulated hypotheses: Model 1 evaluated the overall greenium effect (H1), while models 2, 3 and 4 isolated the individual impacts of the Environmental (H3), Social (H4) and Governance (H2) pillars, respectively.

While the baseline specification captured the average relationship between ESG and the cost of equity over the full sample period, it may mask important temporal heterogeneity. Given the evolving nature

of ESG regulation, investor preferences, and transition-related costs in Poland, the relationship between ESG and the cost of equity was expected to vary over time.

To explicitly account for this time variation, the baseline framework was extended using a phase-based dynamic approach, with the sample divided into subperiods reflecting different stages of ESG development in Poland. Following the classification of transition costs proposed by Gajdzik et al. (2026), three distinct phases were identified:

1. Low Phase (2012–2014): the early stage of ESG awareness on the Polish capital market, pre-dating major sector-specific fiscal burdens and advanced climate regulations;
2. Medium Phase (2015–2021): a period characterized by heightened regulatory pressure, including the introduction of the restrictive banking tax in 2016 and escalating costs associated with the carbon transition in a heavily coal-dependent economy;
3. High Phase (2022–2024): The most recent period, marked by mature sustainability strategies, advanced ESG reporting frameworks (e.g. taxonomy alignments and preparations for CSRD), and intense energy transition efforts following geopolitical shocks.

This phase-based design constituted the core dynamic component of the empirical strategy, allowing the sensitivity of the cost of equity to ESG factors to differ across macro-financial regimes.

Accordingly, extended versions of the models were formulated by interacting the lagged ESG variables with binary indicators (dummy variables) for each phase. In particular, the dynamic version of the aggregate ESG model was specified as:

1. $COE_{i,t} = \alpha + \beta_1(ESG_lag_{i,t-1} * Phase_Low_t) + \beta_2(ESG_lag_{i,t-1} * Phase_Medium_t) + \beta_3(ESG_lag_{i,t-1} * Phase_High_t) + \beta_4Size_{i,t} + \beta_5ROE_{i,t} + \beta_6Leverage_{i,t} + \beta_7NPL_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$
2. $COE_{i,t} = \alpha + \beta_1(E_lag_{i,t-1} * Phase_Low_t) + \beta_2(E_lag_{i,t-1} * Phase_Medium_t) + \beta_3(E_lag_{i,t-1} * Phase_High_t) + \beta_4Size_{i,t} + \beta_5ROE_{i,t} + \beta_6Leverage_{i,t} + \beta_7NPL_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$
3. $COE_{i,t} = \alpha + \beta_1(S_lag_{i,t-1} * Phase_Low_t) + \beta_2(S_lag_{i,t-1} * Phase_Medium_t) + \beta_3(S_lag_{i,t-1} * Phase_High_t) + \beta_4Size_{i,t} + \beta_5ROE_{i,t} + \beta_6Leverage_{i,t} + \beta_7NPL_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$
4. $COE_{i,t} = \alpha + \beta_1(G_lag_{i,t-1} * Phase_Low_t) + \beta_2(G_lag_{i,t-1} * Phase_Medium_t) + \beta_3(G_lag_{i,t-1} * Phase_High_t) + \beta_4Size_{i,t} + \beta_5ROE_{i,t} + \beta_6Leverage_{i,t} + \beta_7NPL_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$

This interaction-based approach allowed for the direct estimation of the required rate of return's sensitivity to ESG factors within specific macroeconomic regimes, testing whether the pricing of sustainability by investors is non-linear, time-varying and context-dependent.

3.3. Diagnostic Testing and Estimation Strategy

A diagnostic procedure was employed to determine the optimal estimation method across all model variants, ensuring statistical robustness for both the static baseline and the dynamic phase-interaction frameworks.

The initial specification tests were conducted on the baseline models (Table 1). The F-test for individual effects rejected the pooled OLS estimator ($p < 0.01$ for all models), indicating the presence of unobservable bank-specific characteristics. Similarly, the Breusch-Godfrey LM favoured the random effects (RE) approach over OLS in most specifications, failing to reject the null hypothesis only for the Governance pillar model at the conventional 5% level. Subsequently, the Hausman test rejected the null hypothesis for the baseline model (aggregate ESG), Social, and Governance models, effectively disqualifying the random effects (RE) estimator for these specifications. Although the Hausman test

failed to reject the null hypothesis for the Environmental (E) pillar model ($p = 0.594$), the fixed effects (FE) model was uniformly adopted across all the analysed variants. This decision was made to ensure methodological consistency, maintain the direct comparability of the estimated structural coefficients, and strictly control for unobservable, time-invariant bank characteristics across the entire research framework. The F-test for time-fixed effects confirmed the presence of significant time-specific unobservable shocks ($p < 0.01$ for all variants) justifying the use of a two-way FE specification.

Further diagnostics across all four specifications revealed a mixed presence of heteroskedasticity and autocorrelation. Specifically, the studentised Breusch-Pagan test rejected the null hypothesis of homoskedasticity at the 5% significance level only in the Governance model, while the Breusch-Godfrey test indicated significant first-order serial correlation exclusively in the Environmental model. Crucially, the Pesaran CD test indicated highly significant cross-sectional dependence across all models ($p < 0.001$), signifying that Polish banks react similarly to unobserved macroeconomic and regulatory shocks.

Relying on classical standard errors in the presence of strong spatial correlation would lead to erroneous statistical inference. Therefore the final models were estimated using the two-way fixed effects estimator with the application of Driscoll-Kraay robust standard errors, which effectively correct for heteroskedasticity, autocorrelation, and cross-sectional dependence simultaneously. Although the presence of heteroskedasticity and serial correlation varied across the individual specifications, this robust approach was uniformly applied to all estimated models. The unified approach was strictly dictated by the universal and highly significant cross-sectional dependence present throughout the entire panel, as well as the methodological necessity to ensure the direct comparability of standard errors and p -values across all analysed ESG pillars. The test results for panel model specification are presented in Table 1.

Table 1. Diagnostic test results for panel model specification

Test	Dependent variable			
	Model 1: Aggregate ESG	Model 2: Environmental (E)	Model 3: Social (S)	Model 4: Governance (G)
F-test for individual effects (OLS vs FE)	4.636*** $p < 0.001$ H_0 rejected	4.831*** $p < 0.001$ H_0 rejected	5.559*** $p < 0.001$ H_0 rejected	4.303*** $p < 0.001$ H_0 rejected
Breusch-Godfrey LM test (OLS vs RE)	5.574** $p = 0.018$ H_0 rejected	5.095** $p = 0.024$ H_0 rejected	6.783*** $p = 0.009$ H_0 rejected	3.289* $p = 0.070$ H_0 not rejected
Hausman test (FE vs RE)	59.639*** $p < 0.001$ H_0 rejected	3.695 $p = 0.594$ H_0 not rejected	23.445*** $p < 0.001$ H_0 rejected	12.542** $p = 0.028$ H_0 rejected
F-test for time-fixed effects (FE vs FE two-way)	19.648*** $p < 0.001$ H_0 rejected	20.617*** $p < 0.001$ H_0 rejected	19.061*** $p < 0.001$ H_0 rejected	19.754*** $p < 0.001$ H_0 rejected
Breusch-Pagan test (Heteroskedasticity)	10.906* $p = 0.053$ H_0 not rejected	9.8874* $p = 0.078$ H_0 not rejected	9.9509* $p = 0.077$ H_0 not rejected	11.233** $p = 0.047$ H_0 rejected
Breusch-Godfrey test (Autocorrelation)	13.512* $p = 0.095$ H_0 not rejected	15.745** $p = 0.046$ H_0 rejected	11.493 $p = 0.175$ H_0 not rejected	14.676* $p = 0.066$ H_0 not rejected
Pesaran CD test (Cross-sectional dependence)	8.154*** $p < 0.001$ H_0 rejected	8.279*** $p < 0.001$ H_0 rejected	7.896*** $p < 0.001$ H_0 rejected	8.261*** $p < 0.001$ H_0 rejected

where: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Source: own study.

Following the baseline diagnostics, an analogous testing procedure was applied to the dynamic phase-interaction models presented in Table 2. The results reaffirmed the appropriateness of the two-way

fixed effects specification, with both individual and time-fixed effects remaining highly significant ($p < 0.01$). The Breusch-Godfrey LM test (OLS vs. RE) and the Hausman test (FE vs. RE) were deliberately omitted from this stage. The inclusion of multiple phase-interaction variables within a relatively small panel ($N = 90$) led to a depletion of degrees of freedom, and under such constraints the RE estimator became mathematically unstable.

Table 2. Diagnostic test results for panel model specification across transition phases

Test	Dependent variable			
	Model 1: Aggregate ESG in phases	Model 2: Environmental (E) in phases	Model 3: Social (S) in phases	Model 4: Governance (G) in phases
F-test for individual effects (OLS vs FE)	3.554*** $p = 0.002$ H_0 rejected	3.993*** $p = 0.001$ H_0 rejected	5.144*** $p < 0.001$ H_0 rejected	3.199*** $p = 0.005$ H_0 rejected
F-test for time-fixed effects (FE vs FE two-way)	14.744*** $p < 0.001$ H_0 rejected	14.901*** $p < 0.001$ H_0 rejected	13.944*** $p < 0.001$ H_0 rejected	16.329*** $p < 0.001$ H_0 rejected
Breusch-Pagan test (Heteroskedasticity)	12.535* $p = 0.084$ H_0 not rejected	16.078** $p = 0.024$ H_0 rejected	16.162** $p = 0.024$ H_0 rejected	13.481* $p = 0.061$ H_0 not rejected
Breusch-Godfrey test (Autocorrelation)	21.06*** $p = 0.007$ H_0 rejected	24.393*** $p = 0.002$ H_0 rejected	18.676** $p = 0.017$ H_0 rejected	20.459*** $p = 0.009$ H_0 rejected
Pesaran CD test (Cross-sectional dependence)	6.539*** $p < 0.001$ H_0 rejected	7.957*** $p < 0.001$ H_0 rejected	6.126*** $p < 0.001$ H_0 rejected	6.135*** $p < 0.001$ H_0 rejected

where: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Source: own study.

Notably, the introduction of time-specific interaction terms intensified the residual disturbances within the panel. While the presence of heteroskedasticity remained mixed (becoming significant in the Environmental and Social phase models at the 5% level), the Breusch-Godfrey test revealed strong first-order serial correlation across all four dynamic specifications ($p < 0.05$). Furthermore, the Pesaran CD test confirmed the persistent and highly significant cross-sectional dependence within the sample ($p < 0.001$). These compounded residual disturbances in the dynamic frameworks strictly reinforce the necessity of the adopted estimation strategy, proving that the application of Driscoll-Kraay robust standard errors was essential to prevent Type I errors and ensure valid statistical inference across all the analysed transition phases.

4. Results

Table 3 presents the descriptive statistics of the variables used in the empirical analysis. The average cost of equity amounted to 11.54%, indicating a relatively high risk premium demanded by investors, which directly reflected the specific regulatory and macroeconomic burdens inherent to the Polish banking sector. The mean aggregate ESG score was 55, with substantial variation across banks, as reflected by the standard deviation. Among the ESG pillars, the Environmental dimension exhibited the highest dispersion (standard deviation of 24.90), suggesting heterogeneous practices across institutions. The control variables displayed values consistent with the characteristics of the banking sector, with relatively high leverage and moderate, yet highly volatile, profitability levels, whereas the non-performing loans ratio averaged 5.65%.

Table 4 reports the results of the baseline panel regressions utilising the two-way fixed effects estimator with Driscoll-Kraay robust standard errors. This static specification captured the average relationship between ESG factors and the cost of equity over the full period (2012–2024).

Table 3. Descriptive statistics

Variable	Mean	Median	St. dev.	Min	Max
COE	11.54%	11.71%	2.62%	4.63%	18.65%
ESG	55.42	53.00	15.99	25.00	87.00
Environmental	56.10	58.00	24.90	15.00	95.00
Social	54.03	58.00	20.87	8.00	91.00
Governance	62.18	66.00	19.60	18.00	95.00
Size	25.62	25.66	0.64	24.41	26.99
ROE	9.72%	9.99%	7.14%	-19.89%	26.54%
Leverage	10.04	9.62	3.11	5.89	23.25
NPL	5.65%	4.49%	2.84%	1.69%	14.06%

Source: own study based on Stooq, LSEG Workspace, Damodaran, and EMIS data.

Table 4. The impact of ESG factors on the Cost of Equity (COE)

Data	Dependent variable			
	Model 1: Aggregate ESG	Model 2: Environmental (E)	Model 3: Social (S)	Model 4: Governance (G)
ESG (lagged)	0.0001 (0.0002) $p = 0.469$			
Environmental (lagged)		0.0001* (0.0001) $p = 0.096$		
Social (lagged)			0.0002** (0.0001) $p = 0.012$	
Governance (lagged)				-0.00005 (0.0002) $p = 0.823$
Bank Size	0.053** (0.023) $p = 0.023$	0.049** (0.023) $p = 0.035$	0.059*** (0.023) $p = 0.010$	0.055*** (0.021) $p = 0.009$
Return on Equity (ROE)	-0.045** (0.023) $p = 0.047$	-0.042* (0.025) $p = 0.088$	-0.053** (0.024) $p = 0.028$	-0.045** (0.020) $p = 0.026$
Leverage	-0.001 (0.001) $p = 0.251$	-0.001 (0.001) $p = 0.499$	-0.001 (0.001) $p = 0.232$	-0.001 (0.001) $p = 0.259$
NPL Ratio	0.021 (0.081) $p = 0.796$	0.033 (0.082) $p = 0.691$	0.021 (0.072) $p = 0.775$	0.011 (0.078) $p = 0.891$
Observations	90	90	90	90
R^2	0.202	0.228	0.219	0.197
Adjusted R^2	-0.093	-0.056	-0.069	-0.100
F Statistic (df = 5; 65)	3.289**	3.848***	3.646***	3.188**

where: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Source: own study based on Stooq, LSEG Workspace, Damodaran, and EMIS data.

The static results do not provide evidence to support the existence of a traditional greenium in the Polish banking sector. In Model 1 the aggregate ESG score exhibited a positive but statistically insignificant relationship with the cost of equity ($p = 0.469$). This suggests that, on average, better overall ESG performance was not associated with lower required returns over the full sample period.

The decomposition into individual pillars revealed additional differences. The Governance pillar (Model 4) was highly insignificant ($p = 0.823$), indicating no measurable relationship with the cost of equity in the static specification. By contrast, the Environmental pillar (Model 2) displayed a positive

coefficient with marginal statistical significance at the 10% level ($p = 0.096$), suggesting that stronger environmental performance was not rewarded by investors with a lower cost of equity. The Social pillar (Model 3) showed a positive and statistically significant coefficient ($p = 0.012$). The estimated effect implied that a 10-point increase in a bank's social score was associated with an increase in the cost of equity by 0.002 (20 base points).

The adjusted R-squared values were negative across all the static models, ranging from -0.056 to -0.100. In the context of a relatively small panel ($N = 90$) and a two-way fixed effects specification, this result was not unusual as the inclusion of both individual and time effects absorbs a substantial part of the variation. At the same time, it suggests that the static framework may not fully capture the underlying structure of ESG pricing in the sample.

To address this limitation, Table 5 presents the dynamic phase-interaction models. These specifications allowed the relationship between ESG factors and the cost of equity to differ across three distinct macroeconomic and regulatory phases: the Low Phase (2012–2014), Medium Phase (2015–2021), and High Phase (2022–2024).

Table 5. The impact of ESG factors on the Cost of Equity across transition phases

Data	Dependent variable			
	Model 1: Aggregate ESG in phases	Model 2: Environmental (E) in phases	Model 3: Social (S) in phases	Model 4: Governance (G) in phases
ESG: Low Phase (2012-2014)	0.0003 (0.0002) $p = 0.158$			
ESG: Medium Phase (2015-2021)	0.0004*** (0.0001) $p = 0.010$			
ESG: High Phase (2022-2024)	-0.0004*** (0.0001) $p = 0.005$			
E: Low Phase		0.0002** (0.0001) $p = 0.011$		
E: Medium Phase		0.0003*** (0.0001) $p = 0.00005$		
E: High Phase		-0.0002 (0.0001) $p = 0.127$		
S: Low Phase			-0.0001 (0.0002) $p = 0.508$	
S: Medium Phase			0.0003** (0.0001) $p = 0.024$	
S: High Phase			-0.001* (0.0003) $p = 0.053$	
G: Low Phase				0.0004 (0.0003) $p = 0.160$
G: Medium Phase				0.00002 (0.0002) $p = 0.908$
G: High Phase				-0.0002* (0.0001) $p = 0.082$

Data	Dependent variable			
	Model 1: Aggregate ESG in phases	Model 2: Environmental (E) in phases	Model 3: Social (S) in phases	Model 4: Governance (G) in phases
Bank Size	0.058*** (0.018) $p = 0.002$	0.047** (0.019) $p = 0.017$	0.061*** (0.018) $p = 0.001$	0.056*** (0.019) $p = 0.004$
Return on Equity (ROE)	-0.046** (0.022) $p = 0.040$	-0.042 (0.028) $p = 0.134$	-0.056** (0.023) $p = 0.015$	-0.024 (0.017) $p = 0.164$
Leverage	-0.001 (0.001) $p = 0.319$	0.0001 (0.001) $p = 0.899$	-0.001 (0.001) $p = 0.279$	-0.001 (0.001) $p = 0.396$
NPL Ratio	0.088 (0.061) $p = 0.152$	0.063 (0.071) $p = 0.376$	0.070 (0.058) $p = 0.229$	0.056 (0.075) $p = 0.454$
Observations	90	90	90	90
R^2	0.337	0.298	0.372	0.292
Adjusted R^2	0.063	0.009	0.113	0.0004
F Statistic (df = 7; 63)	4.569***	3.828***	5.338***	3.719***

where: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Source: own study based on Stooq, LSEG Workspace, Damodaran, EMIS data and Gajdzik et al., 2026.

The results revealed a clear evolution in the pricing of ESG factors over time. For the aggregate ESG score (Model 1 in phases), the coefficient was positive but statistically insignificant in the Low Phase ($p = 0.158$), became positive and statistically significant in the Medium Phase (0.0004, $p = 0.010$), and turned negative and statistically significant in the High Phase (-0.0004, $p = 0.005$). This pattern indicates that the market's assessment of ESG changed substantially over time.

A similar temporal pattern was visible for the individual ESG pillars. The Environmental pillar (Model 2) was positively and significantly associated with the cost of equity in both the Low Phase ($p = 0.011$) and the Medium Phase ($p < 0.001$), while the coefficient became negative and insignificant in the High Phase ($p = 0.127$). The Social pillar (Model 3) was insignificant in the Low Phase ($p = 0.508$), positive and significant in the Medium Phase ($p = 0.024$), and negative with marginal significance in the High Phase ($p = 0.053$). The Governance pillar (Model 4) remained insignificant in the Low and Medium Phases, but became negative and weakly significant in the High Phase ($p = 0.082$).

Compared with the static models, the dynamic specifications improved model fit. The adjusted R-squared became positive in all phase-based models, reaching 0.113 for the Social phase model and 0.063 for the aggregate ESG model. This suggests that temporal heterogeneity is an important feature of the ESG–cost of equity relationship in the Polish banking sector.

Regarding the fundamental control variables, their behaviour remained consistent across both static and dynamic specifications. Return on Equity significantly reduced the cost of equity across most models ($p < 0.05$). Conversely, the variable representing bank size exerted a highly significant ($p < 0.05$ to $p < 0.01$) positive effect on the COE across all specifications. This implies that investors tend to discount the largest Polish financial institutions, potentially demanding a premium for heightened systemic risks, intensive regulatory scrutiny (such as the banking tax), and historical exposure to legacy portfolios. Both Leverage and the NPL ratio remained statistically insignificant in the presence of the two-way FE specification.

5. Hypotheses Verification and Discussion

In light of the empirical results, the formulated research hypotheses can be now reassessed.

Hypothesis 1 is strongly supported by the dynamic phase analysis. While the static specification initially obscured the greenium effect (yielding an insignificant coefficient for the full sample period ($p = 0.469$)), the dynamic framework revealed the exact time-varying pattern predicted by H1. A significant negative relationship emerged exclusively in the High Phase, confirming that the greenium materialised only as ESG frameworks and market expectations were becoming more mature.

Hypothesis 2, which expected the Governance pillar to exert the strongest negative effect on the cost of equity, was also not supported. In the baseline model, governance was clearly insignificant, and even in the dynamic framework its role remained limited. Only in the High Phase did the governance coefficient turn negative and weakly significant. This suggests that governance was not the dominant ESG channel through which investors priced risk in the Polish banking sector during most of the sample period. In a highly regulated banking environment, shaped by comprehensive domestic and European supervisory frameworks, robust corporate governance may be perceived by investors as a fundamental expectation rather than a unique value-enhancing differentiator. Consequently, the market might assume a relatively standardised level of risk control across listed financial institutions, which could explain why the Governance pillar alone did not appear to command a distinct, additional risk premium.

Hypothesis 3 received partial support. The Environmental pillar did not reduce the cost of equity in the static specification – its effect was actually weakly positive. The dynamic results reinforced this conclusion for the earlier phases as environmental performance was positively associated with the cost of equity in both the Low and Medium Phases. This pattern is consistent with the argument that, in a coal-dependent and transition-intensive economy, environmental action may initially be perceived as a source of cost, uncertainty, or exposure to transition-related burdens rather than as an immediate risk-reducing factor; only in the High Phase did this relationship cease to be positive.

Hypothesis 4 is supported. The Social pillar was positively and significantly associated with an increase in the cost of equity in the baseline model, indicating that stronger social performance was, on average, linked to higher investor-required returns. The dynamic analysis revealed that this inverted greenium was concentrated primarily in the Medium Phase ($p = 0.024$), while in the High Phase the coefficient turned negative and became marginally significant (-0.001 , $p = 0.053$). This suggests that the social dimension was initially perceived as an operational burden, but later began to acquire the characteristics of a risk-mitigating factor.

These findings provide an interesting point of comparison with the existing literature. The absence of a statistically significant static greenium effect contrasts with a substantial body of empirical evidence documenting a generally non-negative relationship between ESG performance and financial outcomes (Friede et al., 2015). At the same time, the results are consistent with more recent studies emphasising that the ESG-cost of capital relationship is heterogeneous and context-dependent (Pástor et al., 2021; Bolton & Kacperczyk, 2021).

The Polish case is particularly informative because it combines a relatively developed capital market with structural features typical of a transition economy. Investors in the Polish banking sector appear to have placed greater weight on systemic risk, regulatory burdens, and macroeconomic uncertainty than on ESG performance alone. In such an environment, ESG may initially be interpreted more as a compliance-related expense than as a value-enhancing signal. This interpretation is consistent with evidence from Central and Eastern Europe, where ESG integration is often driven more by regulation than by investor demand or market-based incentives (Buła et al., 2024; Siwec & Karkowska, 2024).

The phase analysis made this pattern even clearer. In the Low Phase (2012–2014), ESG coefficients were largely insignificant, which may reflect limited investor attention, weak disclosure practices, and

the low standardisation of ESG information. In the Medium Phase (2015–2021), aggregate ESG and some of its pillars became positively related to the cost of equity. This period coincided with increased regulatory pressure, the introduction of the banking tax, ongoing CHF-related legal risk, and rising transition uncertainty. Under such conditions, ESG investment may have been perceived as an additional burden on already constrained institutions. In this sense, the observed reverse greenium may reflect concerns that ESG engagement diverted resources away from short-term financial resilience.

By contrast, the High Phase (2022–2024) pointed to a structural shift in market pricing. The negative and significant coefficient for aggregate ESG suggested that investors increasingly interpreted ESG performance as a signal of resilience, preparedness, and more effective risk management. This shift coincided with the growing importance of the EU sustainable finance agenda, including SFDR, taxonomy-related implementation, and preparations for CSRD. Under these conditions, ESG appeared to have evolved from a discretionary or compliance-oriented activity into a factor more directly linked to expectations about future stability and adaptation capacity.

Overall, the findings support the view that ESG pricing in banking should not be treated as static. In the Polish case the market seems to have moved from a phase of indifference, through a phase of penalisation, towards a phase of selective reward. This dynamic perspective helps reconcile seemingly contradictory results and suggests that the financial implications of ESG depend not only on the level of ESG performance itself, but also on the broader regulatory and macroeconomic environment in which such performance is evaluated.

6. Conclusions

This study examined the relationship between ESG factors and the cost of equity in the Polish banking sector, addressing an important gap in the literature on sustainability pricing in emerging and structurally specific financial systems. Using panel data for commercial banks listed on the Warsaw Stock Exchange over the period 2012–2024, the analysis applied a two-way fixed effects model with Driscoll-Kraay standard errors, complemented by a phase-based dynamic specification.

The empirical results do not support the existence of a classical greenium in the static framework. The aggregate ESG score was not significantly associated with the cost of equity, and the Governance pillar remained insignificant throughout most specifications. The Environmental dimension did not reduce the cost of equity, while the Social pillar was positively and statistically significantly related to it, indicating the presence of an inverted greenium in the baseline model.

However the dynamic analysis provides a more nuanced picture, where the relationship between ESG and the cost of equity was shown to be time-varying, evolving across distinct regulatory and macroeconomic phases. In particular, the results suggest a transition from an initial stage of market indifference, through a period in which ESG engagement was associated with higher required returns, to a more recent phase in which stronger ESG performance is increasingly linked to a lower cost of equity. This finding highlights the importance of accounting for temporal and institutional dynamics when assessing the financial implications of sustainability.

These results also show that, in the Polish banking sector, ESG performance is not universally perceived as a value-enhancing factor. Instead, its pricing depends on the broader regulatory environment, transition costs, and investor expectations. In earlier phases ESG activities may have been interpreted primarily as a compliance-related or cost-intensive burden. As regulatory frameworks matured and ESG disclosure became more standardised, sustainability performance appears to have gradually evolved into a more relevant signal of risk management and long-term resilience.

The findings carry implications for both researchers and practitioners. From a theoretical perspective the results reinforce the view that the ESG-cost of capital relationship is context-dependent and

dynamic, rather than universal and stable across markets. For financial institutions they indicate that the financial benefits of ESG engagement may not be immediate and may depend on the stage of market and regulatory development.

This study was subject to several limitations. First, although lagged ESG variables were used to mitigate simultaneity concerns, the potential for endogeneity and reverse causality cannot be fully excluded. In particular, a ‘virtuous circle’ mechanism may be present, whereby financially stronger banks are better positioned to invest in ESG performance, and as a result the findings should be interpreted as robust associations rather than strictly causal relationships. Future research could address this issue using instrumental variable approaches or GMM estimators, once longer time series become available. Second, the analysis focuses on a single country, which limits the generalisability of the results. Third, the relatively small sample size may affect statistical power. Future research could extend the analysis to a broader set of Central and Eastern European countries, incorporate more granular ESG measures, and explore alternative specifications of the cost of capital. Additionally, further studies could examine whether ESG factors are priced differently in the cost of debt compared to the cost of equity.

References

- Azmi, W., Hassan, M. K., Houston, R., & Karim, M. S. (2021). ESG activities and banking performance: International evidence from emerging economies. *Journal of International Financial Markets, Institutions and Money*, 70, 101277. <https://doi.org/10.1016/J.INTFIN.2020.101277>
- Bătae, O. M., Dragomir, V.-D., & Feleagă, L. (2020). Environmental, Social, Governance (ESG), And Financial Performance of European Banks. *Journal of Accounting and Management Information Systems (JAMIS)*, 19(3), 480-501. <https://doi.org/10.24818/JAMIS.2020.03003>
- Bolton, P., & Kacperczyk, M. (2021). Do investors care about carbon risk? *Journal of Financial Economics*, 142(2), 517-549. <https://doi.org/10.1016/J.JFINECO.2021.05.008>
- Bryl, Ł. (2026). Revisiting the Corporate Governance-ESG Performance Nexus: Insights from the CEE Companies. *Central European Economic Journal*, 13(60), 56-75. <https://doi.org/10.2478/CEEJ-2026-0004>
- Buła, R., Foltyn-Zarychta, M., & Krawczyńska, D. (2024). Disentangling ESG: Environmental, social and governance ratings and financial performance of Polish listed companies. *Ruch Prawniczy, Ekonomiczny i Socjologiczny*, 86(1), 149-178. <https://doi.org/10.14746/RPEIS.2024.86.1.09>
- Chava, S. (2014). Environmental Externalities and Cost of Capital. *Management Science*, 60(9), 2223-2247. <https://doi.org/10.1287/MNSC.2013.1863>
- Chen, Y., Li, T., Zeng, Q., & Zhu, B. (2023). Effect of ESG performance on the cost of equity capital: Evidence from China. *International Review of Economics & Finance*, 83, 348-364. <https://doi.org/10.1016/J.IREF.2022.09.001>
- Dhaliwal, D. S., Li, O. Z., Tsang, A., & Yang, Y. G. (2011). Voluntary Nonfinancial Disclosure and the Cost of Equity Capital: The Initiation of Corporate Social Responsibility Reporting. *The Accounting Review*, 86(1), 59-100. <https://doi.org/10.2308/ACCR.00000005>
- El Ghoul, S., Guedhami, O., Kwok, C. C. Y., & Mishra, D. R. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking & Finance*, 35(9), 2388-2406. <https://doi.org/10.1016/J.JBANKFIN.2011.02.007>
- Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*, 5(4), 210-233. <https://doi.org/10.1080/20430795.2015.1118917>
- Gajdzik, B., Wolniak, R., & Grebski, W.-W. (2026). Poland's Renewable Energy Transition (2010-2023): A Fuzzy Time Series and Multi-Criteria Assessment of Transition Quality in Electricity Production. *Energies*, 19(5), 1248. <https://doi.org/10.3390/EN19051248>
- Goss, A., & Roberts, G. S. (2011). The impact of corporate social responsibility on the cost of bank loans. *Journal of Banking & Finance*, 35(7), 1794-1810. <https://doi.org/10.1016/J.JBANKFIN.2010.12.002>
- HAMPL, F., & Vágnerová Linnertová, D. (2024). How do ESG controversies moderate the nexus between ESG performance and cost of capital? Evidence from European listed companies. *Managerial Finance*, 50(10), 1727-1746. <https://doi.org/10.1108/MF-12-2023-0762>
- Lintner, J. (1965). Security prices, risk, and maximal gains from diversification. *The Journal of Finance*, 20(4), 587-615. <https://doi.org/10.1111/J.1540-6261.1965.TB02930.X>
- López-Penabad, M. C., Iglesias-Casal, A., Neto, J. F. S., & Maside-Sanfiz, J. M. (2023). Does corporate social performance improve bank efficiency? Evidence from European banks. *Review of Managerial Science*, 17(4), 1399-1437. <https://doi.org/10.1007/S11846-022-00579-9>
- Modigliani, F., & Miller, M. H. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *The American Economic Review*, 48(3), 261-297.
- Mohammad, W. M. W., Osman, M., & Rani, M. S. A. (2023). Corporate governance and environmental, social, and governance (ESG) disclosure and its effect on the cost of capital in emerging market. *Asian Journal of Business Ethics*, 12(2), 175-191. <https://doi.org/10.1007/S13520-023-00169-2>

- Pástor, L., Stambaugh, R. F., & Taylor, L. A. (2021). Sustainable investing in equilibrium. *Journal of Financial Economics*, 142(2), 550-571. <https://doi.org/10.1016/J.JFINECO.2020.12.011>
- Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The Journal of Finance*, 19(3), 425-442.
- Siwec, K., & Karkowska, R. (2024). Relationship between ESG and Financial Performance of Companies in the Central and Eastern European Region. *Central European Economic Journal*, 11(58), 178-199. <https://doi.org/10.2478/CEEJ-2024-0013>
- Tóth, B., Lippai-Makra, E., Szládek, D., & Kiss, G. D. (2021). The contribution of ESG information to the financial stability of European banks. *Public Finance Quarterly*, 66(3), 429-450. https://doi.org/10.35551/PFQ_2021_3_7
- Wong, R., Thi My Nguyen, H., & Abena Kwansa, N. (2024). ESG performance and cost of capital: What do we know? Evidence from the US. *International Journal of Monetary Economics and Finance*, 17(1), 74-96. <https://doi.org/10.1504/IJMEF.2023.10059849>
- Zerbib, O. D. (2019). The effect of pro-environmental preferences on bond prices: Evidence from green bonds. *Journal of Banking & Finance*, 98, 39-60. <https://doi.org/10.1016/J.JBANKFIN.2018.10.012>

Funding details: This work was financed by the Poznań University of Economics and Business as part of a subsidy received from the Ministry of Science and Higher Education.