The Contribution of ESG Information to the Financial Stability of European Banks

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Abstract
Nowadays, more and more economic operators are publishing information about their contribution to sustainability, their environmental (E), social (S), and governance (G) performance. The attitude of banks towards the above factors is important because they also affect other industries through their investment and lending strategies. The purpose of our paper is to examine the relationship between financial stability (proxied by non-performing loans) and ESG performance (utilizing the ESG score from Refinitiv Eikon). We use panel vector autoregressive procedures on a sample of listed credit institutions (243 banks) in the European Union (EU) and the European Free Trade Association (EFTA) countries. Accounting and market data of the European credit institutions were gathered from the Refinitiv Eikon financial database. Our results indicate that ESG performance significantly reduced the amount of non-performing loans, so financially more stable banks have higher ESG ratios. The risk-reducing effect of regulatory capital was also supported by our model. Based on our study, we can state that the effects of environmental, social, and governance performance on financial stability are positive (reducing non-performing loans), so considering these aspects is important for investors, banks and regulators. Among the sub-indicators, only the governance aspect of ESG shows a significant risk-reducing effect. Our contribution to the academic literature of the effect of the non-financial performance is that bank's financial stability is positively affected by not just profitability but the ESG performance of the bank.

Keyword
ESG score; financial stability; banking; Europe; green finance; panel VAR.

Introduction

One of the emerging global trends in the past few decades has been to focus on the aspects of sustainability in the field of economy. The ideas of various corporate sustainability movements (e.g. triple-bottom-line, CSR, green economy, etc.) (Tóth, 2019) have emerged in the financial sector, too. Although the movements differ in their names, they still have the same goal of incorporating environmental, social, ethical, governance, and other aspects (collectively referred to as non-financial performance) into the mindset of economic actors.

Companies publish their non-financial information to their stakeholders in various reports, because transparency plays a special role in the activities of credit organizations (Bulyga, Sitnov, Kashirskaya, & Safonova, 2020). The evaluation of these reports (e.g. by content analysis) is a resource and time-consuming task. This problem has given rise to sustainability rating agencies or ESG rating agencies, following the example of credit rating agencies, already well-known in the financial markets. Several rating agencies use ESG performance measurement methods to make the non-financial performance of individual companies measurable and comparable. These agencies publish industry rankings and individual ratings based on companies' ESG information.

As part of our study, we examine the contribution of ESG performance to financial stability among European banks. For our research, we used the ESG score from the Refinitiv Eikon database. The ESG score represents a comprehensive corporate score, in which environmental, social, and corporate governance pillars are taken into account with different weights. In the case of the cited studies, the exact terms used by the cited author were used.

Theoretical background

ESG-focused investments have also attracted a lot of interest from investors, one of the advantages of which is that they can reduce the risk of the portfolio, thus enabling the development of a more crisis-resistant portfolio (Broadstock, Chan, Cheng, & Wang, 2021; Kanamura, 2020). In addition, it can improve consumer perception, which can generate additional revenue and can also have positive effects on corporate efficiency and recruitment. Raihan, Bakar, & Islam (2015) confirmed that there is a positive relationship between the amounts spent by banks on CSR activity and productivity.

In line with this, the attitude of banks towards CSR has changed, as they are aware of the importance of their reputation. On the one hand, reputation can affect their relationship with stakeholders and, indirectly, their relationships with other companies, as well as their ability to allocate capital (Carnevale & Mazzuca, 2014). During the crisis, banks also had to respond to customer mistrust and emphasize that they take social considerations into account to ensure depositors' security. CSR activities also improve the reputation of banks, which has a positive impact on their operations (Deutsch & Pintér, 2018).

In 2019, the European Union introduced a specific regulation on sustainability disclosures in the financial services sector to ensure transparency about the actors in this sector and their sustainable investments. As Gyura (2020) points out, compliance or non-compliance is a significant factor affecting profitability. As a new element of compliance with the focus on the treatment of customers, ESG factors will be included in the CRD, the Capital Requirements Directive for banks.

Previous models in the literature

Researches related to ESG disclosure usually examine the motives of the ESG disclosure or the effect of the ESG disclosure on profitability and efficiency.

To examine the financial performance, several variables could be applied like market-based measures (e.g. Tobin's Q, share prices), or other performance indicators (e.g. ROA, ROE, EPS). As control variables the size of the firms, the structure of the owners, the structure of the capital, sector-specific characteristics appear. The level of risk and the cost of the advertisement also could be included. In the case of international researches, external factors (e.g. GDP growth, inflation, population) can be used as control variables (Deutsch & Pintér, 2018).

Buallay (2019) investigated the relationship between performance indicators (ROA, ROE, and Tobin's Q) and ESG disclosure. The sample was constructed of 235 European banks. The sub-indicators of the ESG led to opposing results: the environmental disclosure had a positive impact on the ROA and Tobin's Q, while CSR-related disclosure had a negative impact on the financial performance. The governance disclosure had a negative impact on the ROA and ROE, however, it had a positive effect on Tobin's Q. Birindelli, Dell'Atti, Iannuzzi, and Savioli (2018) concluded that the size of the banks and the ROE is positively associated with the ESG disclosure.

Di Tommaso and Thornton (2020) examined the ESG score's impact on the risk-taking behavior of European Banks and their bank value. Their findings highlighted that the share prices of the banks and Tobin's Q are negatively affected by the environmental, social, and governance disclosure as well. The research highlighted that the regulatory capital and the financial performance of the banks are negatively correlated. Their results confirmed that each sub-indicators have a reduction effect on risk-taking, but also reduces bank value.

Deutsch and Pintér (2018) searched for the factors which influenced the financial performance of the banks. The capital adequacy ratio had a positive impact on ROA and ROE, while the liquidity coverage ratio appeared to have a reductive effect on financial performance. CSR activities are associated negatively with the ROA. Fain's study (2020) did not find the statistical connection between the financial performance of the banks and the ESG disclosure. Ortas, Gallego-Alvarez, and Etxeberria (2015) studied the relationship between corporate social responsibility and environmental management disclosure. Their findings highlighted the size of the companies had a positive impact on the disclosure, moreover, the positive relationship between ROA and disclosure could be confirmed as well. Brammer, Brooks, and Pavelin (2006) pointed out that CSR performance and stock returns are negatively related. Dell'Atti,

Trotta, Iannuzzi, and Demaria (2017) examined 75 large international banks. Their research concluded that CSR has a positive impact on financial performance, while the social, environmental, and governance systems appeared to be negative factors.

Theoretical model

Despite the majority of the literature focusing on ESG's impact on bank profitability, the financial stability of the banking system is also crucial from a macro-prudential point of view. The stability of banking depends on the ratio of the non-performing loans and therefore it contributes to their profitability and their activity as an indirect financial intermediary. Therefore, it is necessary to see, how management decisions (which are proxied in the ESG-scores) are affecting this in the long run. The banking system performs maturity transformation by collecting short-run liabilities and lending them in the longer run, where the economics of scale determines profitability. Meanwhile, their ability to absorb shocks is determined by the capital adequacy ratio, determined as a percentage of different asset classes' risk, which was introduced by the Basel II accords and was extended in the post-2008 world with the introduction of liquidity requirements in Basel III and IV. Therefore, bank profitability should cover the maintenance of all these capital buffers as well. The challenges in the external environment and the changes in the monetary policy are playing an emergent factor as well. The concept of our theoretical model can be written (1) as the following way:

$$financial\ stability = f(external\ environment, monetary\ policy, management, economics\ of\ scale, capital\ adequacy, profitability, liquidity) \quad (1)$$

To operationalize this concept, we need economic and company-specific variables. Table 1 covers the list of the commonly used variables in the literature when the usage of ESG-score in banking was analyzed. This paper uses them in the formation of the operational theoretical model with its unique attention to financial stability. Therefore, the ratio of non-performing loans (NPL_t) is used to approximate the financial stability of the individual bank since it is used commonly for this purpose (Azmi, Hassan, Houston, & Karim, 2021; Sánchez Serrano, 2021; Treapăt & Anghel, 2014). Since foreign exchange rates are representing the external balance of the economy, the value of US dollars in national currency (FX_t) will be used to symbolize the changes in the broader business environment. Meanwhile, monetary policy responses and funding conditions will be represented by the long-term (10 years) government bond yield ($10Y_t$) as a benchmark, since both key policy rate decisions and open market or market maker of last resort activities will have an impact on it (Gimenez Roche & Janson, 2019).

Table 1. The appearance of the main variables in the literature

Category	Variable	Literature			
Profitability	ROE	Buallay (2019)	Birindelli et al. (2018)	Deutsch – Pintér (2018)	
	P/E	Di Tommaso – Thortorn (2020)	Brammer et al. (2006)	Dell'Atti et al. (2017)	Dell'Atti et al. (2017)

Size	TA/GDP	Ortas et al. (2015)	Birindelli et al. (2018)	Deutsch – Pintér (2018)	
Balance sheet structure	Liquidity	Deutsch – Pintér (2018)			
	Capital adequacy	Di Tommaso – Thortorn (2020)			
Management	ESG	Di Tommaso – Thortorn (2020)	Birindelli et al. (2018)	Fain (2020)	Buallay (2019)

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The internal corporate culture and lending standards are determined by the management, what is approximated in the environment (E), social (S), and governance (G) dimension in the ESG-score (ESG_t). This paper studies the impact of the entire ESG-score and the sub-dimension scores as well. The relative size of the bank can have a crucial influence on banking operations: on one hand, it determines the level of the economics of scale, the embeddedness or exposure to the economy, and the market share, while on the other hand, large banks can easily be the subject of the Single Supervision of the European Central Bank in the bank union countries due to their "too big to fail" status. The capital adequacy ratio (CA_t) connects the asset side of the balance sheet to the shock-absorbent capital of the bank, so higher ratios can contribute to the greater resilience of the bank. The efficiency of the maturity transformation and general operations can be measured through the Return-on-Equity (ROE_t) and through the Price / Earnings (P/E_t) ratio. Meanwhile the liquidity (L_t) of the bank represents the cash-like (deposits at other banks or the central bank) assets that are not lent out or invested on the securities market.

To capture exogenous shocks on the model, the changes in the regulatory environment was represented by the $dummy_{basel2}$ variable to mark the introduction of the Basel 2 accords and its legacy. Further changes in the institutional environment are represented by the European Union ($dummy_{eu}$) and Eurozone-membership ($dummy_{ez}$) dummies, while recessions ($dummy_{ez_{recession}}$) were captured through the European Commission's Business Cycle Clock statistics.

$$\left(\ln(NPL_t)\right) = \omega + \beta_1 \Delta\left(\ln(FX_{t-1})\right) + \beta_2\left(\Delta 10y_t\right) + \beta_3\left(\ln(ESG_t)\right) + \beta_4\left(ln(TA_t/GDP_t\right) + \beta_5\left(\ln(CA_t)\right) + \beta_6\left(ln(ROE_t\right) + \beta_7\left(ln(P/E_t\right) + \beta_8\left(ln(L_t\right) + \beta_9\, dummy_{basel2} + \beta_{10}\, dummy_{eu} + \beta_{11}\, dummy_{ez} + \beta_{12}\, dummy_{ez_{recession}} + \varepsilon_t \quad (2)$$

Based on the previous findings in the literature and intuitively we can anticipate the following signs for each variable. Higher numbers at exchange rates represent depreciation, therefore it can be a sign of an automatic stabilization after an external systemic shock ($\beta_1 < 0$), but it can contribute to further balance-sheet risks due to foreign exchange rate exposures of the bank ($\beta_1 > 0$). An increased long-term sovereign funding cost can be the sign of elevated inflation expectation or recovery after a deflationary period ($\beta_2 < 0$), but it can represent structural questions about the sustainability of the sovereign debt ($\beta_2 > 0$). Higher ESG-scores are suggesting higher standards during operations ($\beta_3 < 0$), but it is uncertain, how the elevated

environmental ($\beta_{E-ESG,3} > 0$) or social ($\beta_{S-ESG,3} > 0$) sensitivity can contribute to the low levels of non-performing loans. Relative size should be neutral or provide robustness ($\beta_4 < 0$). The capital adequacy ratio is high when there are not so many losses on the lending since no capital was absorbed by them ($\beta_5 < 0$) – however, supervisory agencies tended to increase this ratio at the beginning of stressful times to prepare banks for future losses ($\beta_5 > 0$). Profitability ratios should add a further redundancy to the business ($\beta_6 < 0, \beta_7 < 0$). Liquidity can be the benchmark of robustness ($\beta_8 < 0$) since these assets are highly secured, however, the bank may be unable to conduct lending operations during a recession ($\beta_8 > 0$). These anticipations will be tested with the accumulated impulse response functions of a long-term structural panel Vector Autoregression (VAR) model.

Research methodology

Data

Our sample covered 243 public listed banks from the member states of the European Union and the European Free Trade Association, where the bank-specific annual report data and the ESG scores were acquired from the Refinitiv Eikon database, as well as the country-specific USD exchange rates and the 10 years sovereign bond yields. Since a stable VAR requires the weak stationarity of the input variables, panel unit-root tests (namely Levin, Lin, & Chu test) were conducted (Lütkephol, 2005), which proved that all of our input variables were able to meet this requirement (Table 2). However, the seemingly high kurtosis in some variables required the inclusion of the recession dummy variables to manage exogenous shocks.

Table 2. Descriptive statistics of the variables

	CA	10Y	FX	E_ESG	G_ESG	S_ESG	ESG	LIQ	NPL	PE	ROE	TA/ GDP
Mean	-1,8519	-0,2754	-0,0036	3,7850	4,0885	4,1008	4,0143	-2,8215	-3,2869	2,6565	-2,6410	-1,3101
Median	-1,8357	-0,1300	-0,0194	4,1976	4,2817	4,2263	4,1427	-2,6452	-3,1301	2,5549	-2,4830	-1,0822
Maximum	-1,1457	1,5050	0,1915	4,9756	4,9844	4,9976	4,5541	-1,1942	-0,4452	5,9765	0,1246	2,8023
Minimum	-2,4225	-3,2690	-0,3053	-0,1983	1,6487	2,1997	2,1531	-5,6795	-6,9686	-0,3811	-6,5279	-5,2405
Std.Dev.	0,2495	0,8581	0,0885	1,0066	0,5284	0,4744	0,4319	0,9175	1,2354	0,7313	0,9302	1,4919
Skewness	0,1401	-1,2058	-0,0647	-1,9736	-1,5840	-1,2489	-1,5730	-0,8178	-0,4495	0,7308	-1,1235	-0,2823
Kurtosis	2,9426	4,7332	2,4877	6,8113	5,5716	4,7112	5,5392	3,4020	3,1819	6,8897	5,6954	2,8713
Jarque-Bera	0,8757	94,4429	2,9895	322,3	178,2	98,2	175,0	30,38	9,0075	184,9	131,9	3,5911
P	0,6454	0,0000	0,2243	0,0000	0,0000	0,0000	0,0000	0,0000	0,0111	0,0000	0,0000	0,1660
Observations	257,0	257,0	257,0	257,0	257,0	257,0	257,0	257,0	257,0	257,0	257,0	257,0
Unit-root: Levin, Lin & Chu t-stat	-100,0	-28,7	-51,7	-41,6	-32,3	-15,8	-15,2	-14,5	-104,2	-29,4	-50,2	-16,3
P	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000

Authors' calculation in Eviews 11

Methods

Panel VAR provides efficient estimations of coefficients in the system with endogenous variables (Jouida, 2018). Vector autoregressive (VAR) processes describe the data generation process of a smaller amount of time series variable, where a priori

endogeneity is assumed for each variable and their dynamics are considered. This procedure accounts for the dynamic interactions of a set of N time series variables: $y_t = (y_{1t}, \ldots, y_{Kt})'$. The basic VAR model can be defined in the following reduced form (5) (Lütkephol, 2005):

$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + \varepsilon_t, \quad (5)$$

where yt is the (Nx1) vector for the model variables, Fi is the matrix for (NxN) autoregression coefficients and the $\varepsilon_t = (u_{1t}, \ldots, u_{Kt})'$ is the unobserved error term vector with (Nx1) Gaussian distribution where $\varepsilon_t \sim (0, E(u_t, u_t'))$ is a positive definite covariance matrix. The optimal lag length of the model will be selected by the Schwarz (or Bayesian) information criteria (SC), Akaike information criteria (AIC), Hannan–Quinn information criteria (HQ) to check consistency and asymptotic normality of the data. Then the standardized condition for stability is tested to see if modulus values are smaller than one which implies the invertible interpretations and the interpretations of infinite order-vector moving averages (Lütkephol, 2005).

When writing equation (5), several restrictions of the parameters are plausible: in the case of the Blanchard–Quah's long-term restriction, the appearance of the shock can be described. It requires the introduction of the structural (6) version of the reduced VAR formula (with a time lag p and three variables with structural coefficients A and As):

$$Ay_t = A_1^s y_{t-1} + \cdots + A_p^s y_{t-p} + Bu_t, \text{ where } \varepsilon_t = A^{-1}Bu_t \text{ and } S = A^{-1}B. \quad (6)$$

In the long-term restriction (Blanchard & Quah, 1988) (7), the shock is represented in the row of the F-matrix where the variable appears, and the cumulative long-term effect of the shock is zero and Ψ the long-term multiplier ($F = \Psi S$) is:

$$(I - A_1 - \cdots - A_p)^{-1} \varepsilon_t = \Psi \varepsilon_t = F u_t \quad (7)$$

The structure of the F-matrix describing long-term effects and in the Eviews 11 econometric program it is determined by the loading order of the variables into the VAR model – assuming that there will be a shock that will affect each variable, and the last variable of the sequence will be the one which affects itself only. The structure of the F-matrix (Table 3) was determined by our theoretical model which provided the highest, global influence for the exchange rate an external balance proxy variable, and the smallest, local for the liquidity.

Table 3. Structure of the F-matrix of the long-term effects

		Shock							
		FX	**10Y**	**ESG**	**TA/GDP**	**CA**	**ROE**	**P/E**	**Liquidity**
Variable	**FX**	f_{11}	0	0	0	0	0	0	0
	10Y	f_{21}	f_{22}	0	0	0	0	0	0
	ESG	f_{31}	f_{32}	f_{33}	0	0	0	0	0
	TA/GDP	f_{41}	f_{42}	f_{43}	f_{44}	0	0	0	0
	CA	f_{51}	f_{52}	f_{53}	f_{45}	f_{55}	0	0	0
	ROE	f_{61}	f_{62}	f_{63}	f_{65}	f_{65}	f_{66}	0	0
	P/E	f_{71}	f_{72}	f_{73}	f_{75}	f_{75}	f_{76}	f_{77}	0
	Liquidity	f_{81}	f_{82}	f_{83}	f_{85}	f_{85}	f_{86}	f_{87}	f_{88}

Authors' calculation in Eviews 11

The impulse response functions can be considered as the effect of a unit shock on a given model variable. The variance decomposition makes it possible to determine which shocks are decisive in the short- and long-term evolution of certain variables, i.e. the proportion of the uncertainty of variable *i* that can be attributed to the *j*th shock after period *h*.

Findings

This paper used annual data from the financial reports of the banks in the sample. The lag-number of the VAR model was determined by the Information Criteria (namely Akaike – AIC, Schwarz – SIC, Hannan-Quinn – HQIC) minimums, therefore the consensus was 1 lag (Table 4).

Table 4. VAR lag order selection

ESG	Lag	LogL	LR		FPE		AIC		SIC		HQIC	
	0	-652,9	NA		0,0000		11,0785		12,0914		11,4900	
	1	110,9	1358,0		0,0000	*	**0,2389**	*	**3,0752**	*	**1,3912**	*
	2	179,3	111,8	*	0,0000		0,4394		5,0990		2,3324	
	3	245,8	99,1		0,0000		0,6705		7,1534		3,3043	
	4	318,1	97,6		0,0000		0,8085		9,1148		4,1831	
E-ESG	0	-462,9	NA		0,0000		12,6977		14,0376		13,2349	
	1	7,0	775,3		0,0000		2,9761		**6,7278**	*	**4,4803**	*
	2	94,6	124,9		0,0000	*	2,8101		8,9736		5,2812	
	3	181,4	104,1	*	0,0000		2,6654		11,2407		6,1035	
	4	277,7	93,9		0,0000		2,2828	*	13,2699		6,6878	
S-ESG	0	-516,6	NA		0,0000		12,3419		13,5836		12,8428	
	1	-57,6	776,6		0,0000	*	**4,0361**	*	**7,5127**	*	**5,4387**	*
	2	18,4	113,7	*	0,0000		4,1444		9,8559		6,4486	
	3	96,5	101,2		0,0000		4,2086		12,1551		7,4145	
	4	171,6	82,5		0,0000		4,3388		14,5202		8,4463	
G-ESG	0	-505,6	NA		0,0000		11,9690		13,2024		12,4668	
	1	-49,6	773,2		0,0000	*	3,8164		**7,2701**	*	**5,2103**	*
	2	20,6	105,2		0,0000		4,0530		9,7270		6,3431	
	3	109,9	116,5	*	0,0000		3,8722		11,7665		7,0584	
	4	200,6	100,6		0,0000		3,6605	*	13,7751		7,7428	

Authors' calculation in Eviews 11

The 1 year lagged models provided inverse roots within the unit circle in all cases and the modulus variables were less than one, meaning the PVAR model satisfied the stability condition (Table 5).

Table 5. Roots of Characteristic Polynomial

variable no.	ESG			E-ESG			S-ESG			G-ESG		
	Root		Modulus	Root		Modulus	Root		Modulus	Root		Modulus
	Real	Imag.		Real	Imag.		Real	Imag.		Real	Imag.	
1	0,9809		0,9809	0,9803		0,9803	0,9823		0,9823	0,9824		0,9824
2	0,8329		0,8329	0,8875		0,8875	0,8635	-0,0282	0,8640	0,8877		0,8877
3	0,8258	-0,0200	0,8260	0,7888	-0,0322	0,7895	0,8635	0,0282	0,8640	0,8278		0,8278
4	0,8258	0,0200	0,8260	0,7888	0,0322	0,7895	0,8395		0,8395	0,7587		0,7587

5	0,7550	0,7550	0,7818	0,7818	0,6962	0,6962	0,6819	-0,0815	0,6868
6	0,5903	0,5903	0,6427	0,6427	0,6687	0,6687	0,6819	0,0815	0,6868
7	0,3968	0,3968	0,5109	0,5109	0,5444	0,5444	0,5551		0,5551
8	-0,3012	0,3012	-0,2455	0,2455	-0,2514	0,2514	-0,2557		0,2557
9	-0,1310	0,1310	-0,0743	0,0743	-0,0975	0,0975	-0,0922		0,0922

Authors' calculation in Eviews 11

Focusing on the impulse response functions of the entire ESG-score (Figure 1), our findings are similar to the anticipations. Banks with high ESG-scores contributed to low NPL levels, in the long run, meaning that this benchmark can be useful during the estimation of financial stability. Meanwhile profitable banks with high ROE and P/E ratios were able to maintain their low NPL levels. The influence of the elevated 10Y sovereign bond yields seems to be counter-intuitive at first, but elevated long-term interest rates mean that only projects with higher Internal Rate of Return (IRR) will be financed, leading to a more robust loan-portfolio (or the recovery from the deflationary periods were acknowledged). However, the positive influence of the elevated liquidity levels is meaning that banks with high-NPL levels are not able to lend (due to lack of acceptable projects or interest) at their full potential. At the same time, foreign exchange rate, relative size, and capital adequacy ratio were not significant.

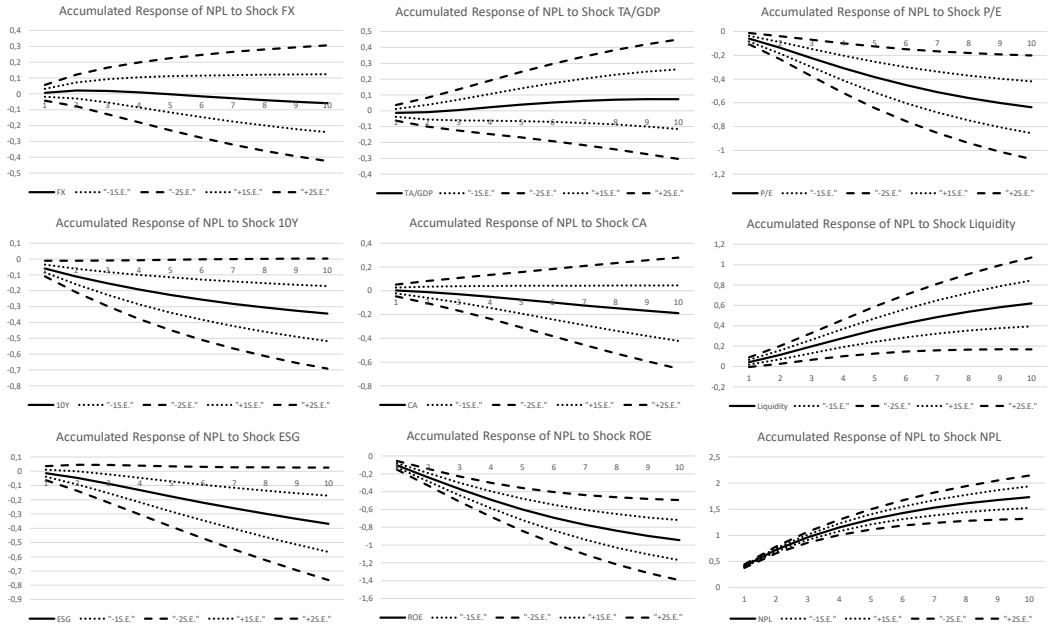

Figure 1. The long-term restricted aggregated impulse response function of the NPL ratio on the entire ESG ratio
(Authors' calculation in Eviews 11)

Moreover, it is necessary to test the model for the impact of the individual ESG subcomponents to check its robustness (the rest of the variables should have a similar impact) and the influence of each dimension – since it is uncertain, how the elevated environmental or social attention can contribute to the low levels of the non-

performing loans (Table 6). First, we can say that the environmental (E-ESG) sub-index had no significant influence, which is not surprising due to the nature of the financial services, similarly to Demir & Danisman (2021). However, the social (S-ESG) component had a positive connection, reinforcing the accumulation of elevated NPL levels in the medium run. This means that mainly the governance (G-ESG) component is responsible for the overall beneficial influence of the ESG-score on the level of NPL-ratio. This is not too surprising, since mainly this variable is responsible for the description of the managerial attitude, crisis and risk management routines, business conduct codes, etc.

Meanwhile, the rest of the variables maintained the direction of their influence, but the foreign exchange rate (FX) gained a negative influence, which points to the shock-absorbent nature of the currency as well as the relative size and capital adequacy ratio contributed to lower NPL levels.

Table 6. Summarized results of the long-term restricted aggregated impulse response functions of the different ESG subcomponents (detailed: Appendix 1)

score	ESG		E-ESG		S-ESG		G-ESG	
conf. int.	68%	95%	68%	95%	68%	95%	68%	95%
FX	none	none	"-"	"-"	"-"	"-"	"-"	"-"
10Y	"-"	"-" for 5 yrs	"-"	"-"	"-"	"-"	"-"	"-"
ESG	"-"	"-" after 4 yrs	none	none	"+" for 3 yrs	"+" for 1 yr	"-"	"-" after 5 yrs
TA/GDP	none	none	"-"	"-" after 4 yrs	"-"	none	none	None
CA	none	none	"-"	"-"	"-"	"-" for 7 yrs	"-"	"-" for 6 yrs
ROE	"-"	"-"	"-" after 5 yrs	none	"-" after 6 yrs	none	"-" after 5 yrs	none
P/E	"-"	"-"	"-" for 3 yrs	none	"-" after 8 yrs	none	"-"	none
Liquidity	"+"	"+"	"+"	"+"	"+"	"+"	"+"	"+"
NPL	"+"	"+"	"+"	"+"	"+"	"+"	"+"	"+"

Authors' calculation in Eviews 11

Despite its significance in the impulse response functions, the ESG and its sub-indices had low weight in the forecast error variance decomposition of the NPL (Table 7). Only the ROE (~15%), liquidity, and P/E (~5-5%) had a remarkable weight for the entire ESG (see Appendix 2), while 10Y joined with nearly 15% at the E-ESG, S-ESG, and G-ESG with a ~10% liquidity as well. It means that the contribution of the ESG and its sub-indices contributed with limited information in the autoregression only.

Table 7. The long-term restricted forecast error variance decomposition function of the NPL ratio on the different ESG subcomponents (detailed: Appendix 2)

	ESG	E-ESG	S-ESG	G-ESG
1	0,0989	0,0219	1,8948	0,0094
2	0,3958	0,0302	1,3812	0,8847
3	0,7245	0,0246	1,1144	1,8096
4	1,0292	0,0274	0,9573	2,7074
5	1,3009	0,0573	0,8720	3,4570
6	1,5388	0,1189	0,8353	4,0521
7	1,7477	0,2075	0,8321	4,5090
8	1,9326	0,3146	0,8520	4,8552
9	2,0976	0,4314	0,8871	5,1170
10	2,2461	0,5506	0,9319	5,3164

Authors' calculation in Eviews 11

Conclusions

The importance of ESG information in banking operations is unquestionable. At a theoretical level, environmental, social, and corporate governance performance can improve banks' image, operations, and profitability through multiple channels. Our research aimed to examine whether there is a positive relationship between stability and ESG performance among listed credit institutions in the EU and EFTA countries.

Our results suggest that ESG performance has a significant negative impact on the level of nonperforming loans so that financially more stable banks have higher ESG indicators. Unsurprisingly, regulatory capital triggers a risk-reducing impulse. Based on our research, we state that the positive effects of environmental, social, and corporate governance contributions on profitability are prevalent, and therefore this is an aspect that banks, investors, and regulators should take into consideration.

Many more questions can be raised on the subject. There is little consensus in the literature on the impact of sub-indicators on operational safety and profitability, so there is much scope for further research. Another direction could be to broaden the time horizon of the research or the scope of the institutions included in the sample, and perhaps a comparison with other industries could also lead to interesting conclusions.

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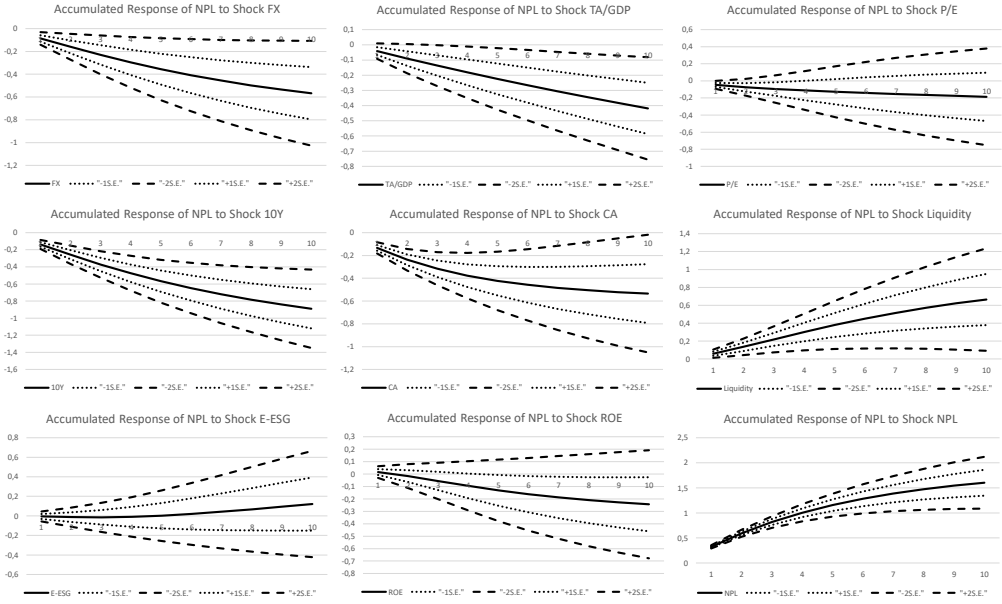
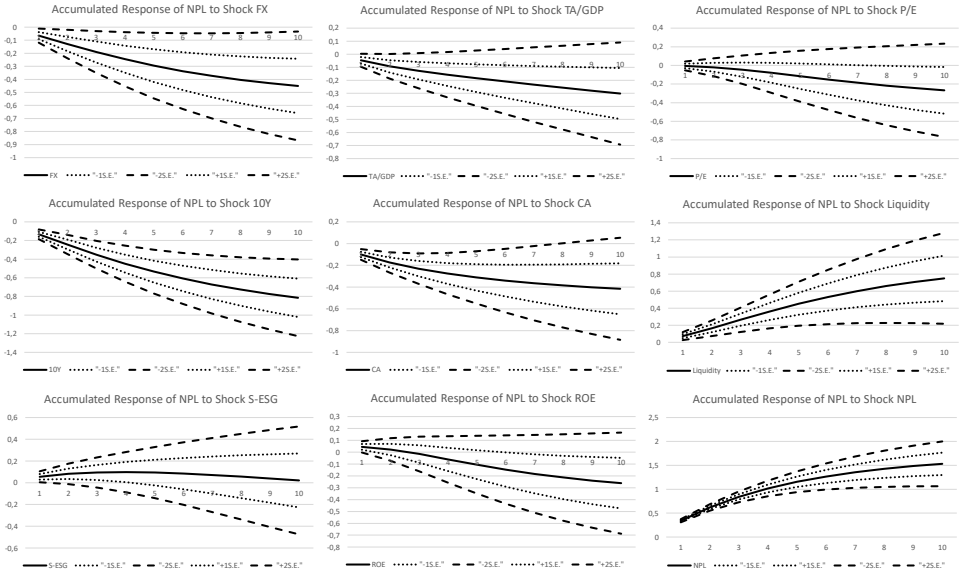
Appendix 1. Long-term restricted aggregated impulse response functions for the ESG subcomponents (Authors' calculation in Eviews 11)

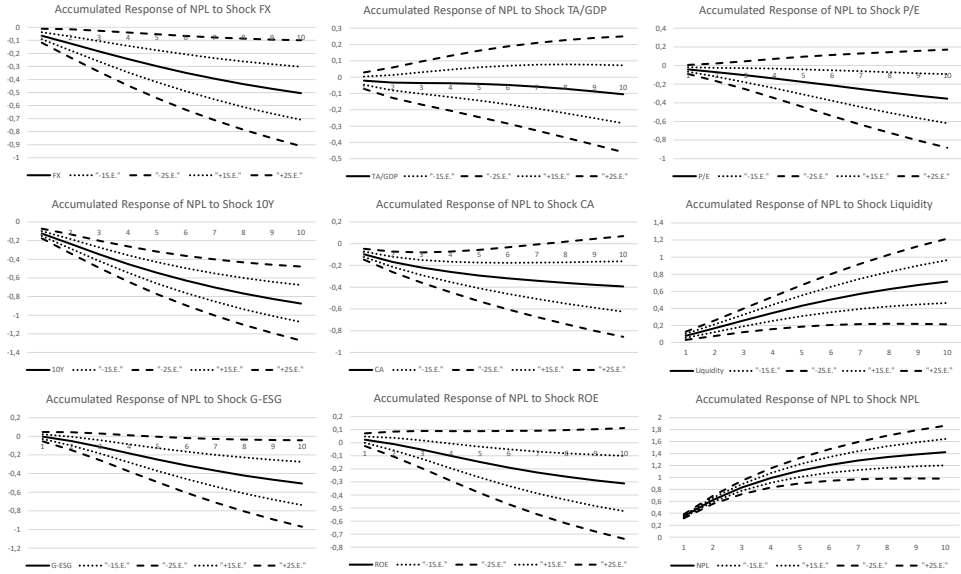
E-ESG



S-ESG

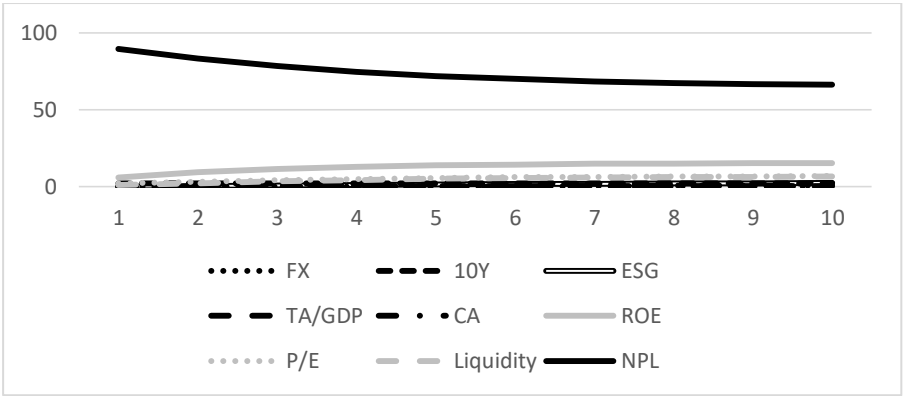


G-ESG

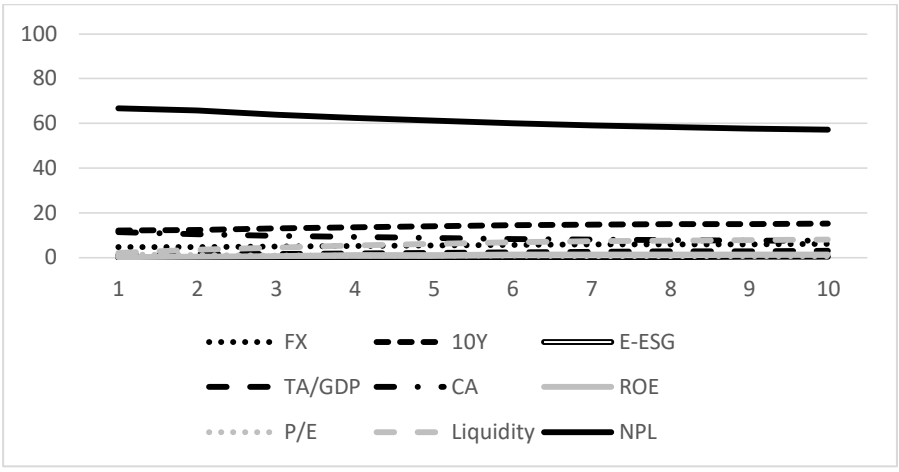


Appendix 2. Long-term restricted forecast error variance decomposition functions for the ESG subcomponents (Authors' calculation in Eviews 11)

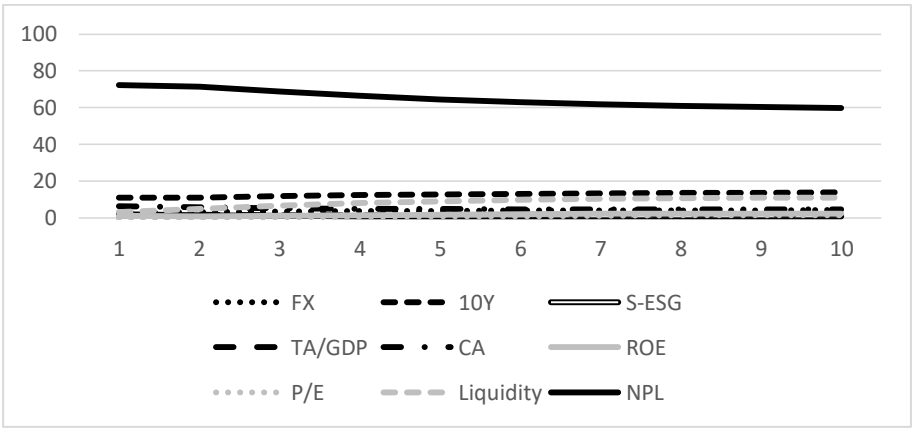
ESG



E-ESG



S-ESG



G-ESG