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Optimizing the Relationship between Profitability and Corporate Responsibility – The Case of the Allianz Group

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Abstract. *In this paper there will be examined a relationship using Allianz Group's sustainability and financial reports from 2019 to 2023, focusing on key financial and ESG indicators. The existing literature shows combined findings between the ESG and the financial performance link. While some studies suggest a positive correlation, there are some that highlight industry-specific variations. However, some voids in the research remain regarding ESG impacts over the financial metrics in the insurance sector. This study employs multiple linear regression (OLS) to analyze ESG-financial performance relationships. Three models assess the effects of renewable energy, dNPS, employee satisfaction, Solvency, and GHG emissions on operating profit, RoE, and also EPS. Due to the small sample size and some possible effects of extreme values of the OLS estimates, there was a robust regression method implemented for the results validation. There are findings showing that renewable energy has a positive over the operating profit, on a moderate scale. The social factors, particularly dNPS, negatively correlate with profitability, most likely because of the high customer experience costs. Solvency emerges as the strongest predictor of financial stability. Even though there are statistical limitations, this study's results suggest ESG integration can enhance long-term financial outcomes. Future research should explore larger datasets and macroeconomic factors to assess ESG's lagged effects on profitability. Also, because of the statistical limitations, the results should be considered in more exploratory terms then definitive ones, serving as a foundation for future research which might include bigger datasets and companies for a bette result.*

Keywords: ESG, financial performance, Allianz Group, sustainability, profitability, corporate responsibility, regression analysis.

Introduction

There is a growing emphasis to corporate responsibility, particularly through the integration of the environmental, social, and governance (ESG) factors, that reshaped the businesses approach profitability. As there are more companies that strive to balance financial success with social and environmental obligations, there is a question that arise: is there a possibility for the companies to simultaneously optimize their profitability while maintaining robust corporate responsibility practices? This paper will focus on this critical question by analyzing the Allianz Group's

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performance, considering its sustainability and financial reports from from the period 2019-2023. This research purpose is to provide insights into the interplay between profitability and corporate responsibility within a leading global insurance company, providing evidence on how integrating ESG factors can influence financial outcomes.

The main research question of the study addresses the relationship between ESG factors and financial performance, specifically within the insurance sector, an area that has seen limited factual research on this topic. The author examines how the key ESG indicators for example renewable energy usage, (GHG) emissions, the (dNPS), employee satisfaction, and solvency may impact critical financial metrics, including operating profit, (RoE), and EPS. By analyzing Allianz's performance over a five-year period, the study explores whether and how these ESG factors contribute both directly and indirectly to the financial stability and also the profitability.

The research hypotheses are centered around the potential correlations between ESG integration and key financial outcomes. The primary hypothesis suggests that by adopting the ESG initiatives, particularly in the areas of renewable energy and employee satisfaction, there may be positive influences on the financial performance, although with some industry-specific variations. However, the paper also considers the possibility of negative correlations, particularly with social factors such as customer experience (represented by dNPS), which may involve high costs that could offset profitability in the short term.

To assess these relationships, the study gathers multiple linear regression (OLS) models to evaluate the impact on the financial performance indicators through the variety of the ESG factors. This analysis include logarithmic transformations to improve data normality and enhance interpretability. The findings indicate that while renewable energy usage positively impacts operating profit, the relationship is moderate. Conversely, social factors, such as dNPS, show a negative correlation with profitability, most probably due to high costs associated with improving customer experience. Notably, solvency emerges as the strongest predictor of long-term financial stability, underlining the importance of financial resilience in ESG integration.

This study contributes to the growing body of literature on ESG and corporate performance by providing empirical evidence from the insurance sector, a field where such research is still relatively scarce. The findings suggest that while ESG factors can influence financial outcomes, their effects may vary, and more research is needed to understand their long-term impact fully. The paper calls for future studies to explore larger datasets and macroeconomic factors to assess the lagged effects of ESG on profitability.

In this article we try to underscore the importance of optimizing the relationship between profitability and corporate responsibility, presenting a detailed analysis of how Allianz Group navigates this challenge. This study offers valuable insights for other companies seeking to balance financial success with social and environmental responsibilities in an increasingly ESG-conscious business world.

Literature review

The integration of the (ESG) factors into corporate strategies became an important issue in business research, with growing attention paid to its impact on financial performance. This literature review gathers key findings from existing research and provides background on how corporate responsibility is linked to profitability, specifically focusing on the role of the ESG in the insurance industry. This review aims to establish the theoretical and factual foundation for the current study, which explores how Allianz Group balances profitability with corporate responsibility. This

literature will present mixed results regarding the relationship between ESG practices and also the financial performance, preparing to contribute to this debate.

Stepping into defining ESG and corporate responsibility: this indicator refers to the three main pillars that evaluate a company's commitment to sustainability and ethical practices. First one the environmental component that involves a company's impact on the planet, including its carbon footprint and resource usage. The second one being the social factors that focus on how businesses manage relationships with employees, customers, and communities, while the third point, governance, covers different factors such as leadership, executive pay, audits, and internal controls. Corporate responsibility, commonly known as CSR (corporate social responsibility), is about businesses going beyond just making a profit. It means operating in a way that benefits not only shareholders but also employees, customers, communities, and the environment.

The connection between ESG and financial performance: defined as a body of research that explore the relationship, with conflicting results. An article present by Eccles et al. (2014) suggest a positive relationship, indicating that corporate sustainability and ESG integration may have as a result improved financial performance by improving operational efficiency while reducing risk, and increasing shareholder value. These findings are supported by Friede et al. (2015), whose analysis over 2,000 empirical studies conclude that, in most cases, we have a positive relationship between ESG and financial performance. This may suggests that companies that are more committed to sustainability tend to experience better financial outcomes, in part due to enhanced reputation and stakeholder trust.

However, there are also different studies that shows mixed or negative findings. Chouaibi et al. (2021) highlight that the ESG-financial performance link may vary considering the industry, legal systems, and geographical context. In the article they find that green innovation in the UK's common law system is more positively related to financial performance than in Germany's civil law system, suggesting that institutional frameworks play a moderating role in the relationship between the ESG-financial performance. This variance is further explored by Chen et al. (2023), who argue that ESG's impact on financial outcomes is highly sector-specific, and in some industries, the costs associated with ESG efforts may outweigh the benefits, leading to lower profitability in the short term.

The social and governance factors of ESG are continuously being recognized as significant drivers of corporate performance. As a short example, the employee satisfaction has been shown to correlate positively with long-term financial success, as engaged employees tend to be more productive and contribute to better customer service Susen et al.(2024). In a similar way, there are governance factors such as the size and composition of a company's board that are associated with better decision-making and enhanced financial performance Álvarez et al., (1998). In contrast, in a paper presented by (Torri et al., 2023) social factors such as customer experience, as reflected in the (dNPS) can have a negative impact on profitability in the short term run mostly due to high costs associated with improving customer experience. In this perspective these mixed effects underscore the complexity of the relationship between different ESG dimensions and financial outcomes.

In terms of environmental factors and profitability, the environmental dimension of ESG and particularly the focus on renewable energy usage and (GHG) emissions was proven to have a direct impact on financial performance. Different studies such as those by Boakye et al. (2021) and Xie et al. (2019), suggest that the companies that invest in sustainable practices like renewable energy not only improve their public image but can also benefit from cost savings, increased operational efficiency, and regulatory incentives. In Allianz's case, the study of Chouaibi et al.

(2021) presents that environmental disclosures have a positive relationship with financial performance, especially when green innovation is incorporated into the business model.

The role of ESG disclosure in bridging the gap between corporate responsibility and financial performance has gained significant attention, presented more in the article of Conca et al. (2021) where it's highlighted that transparent ESG reporting in European-listed companies enhances stakeholder trust and leads to better access to capital. This is particularly relevant in the insurance sector, where companies like Allianz are increasingly scrutinized for their environmental and social impacts. Disclosures are seen as a means to communicate commitment to sustainability, potentially leading to long-term profitability through improved stakeholder relations and reduced reputational risks Mittelbach-Hörmanseder et al. (2021).

Literature gap is available even though there was an extensive examination of the relationship of ESG and financial performance, particularly in the context of the insurance sector. A key gap is the lack of empirical studies specifically addressing how ESG factors affect financial metrics. There are different studies that focus on broader sectors or individual ESG factors, such as environmental performance without considering the interaction between all three ESG dimensions in influencing profitability as seen in Chen et al., 2023; Xie et al. (2019).

Even so, much of the existing research has not addressed the moderating role of industry-specific factors or the long-term implications of ESG integration on profitability. There are different studies like for example those of García et al. (2020) and Alsayegh et al. (2020) that examine general ESG disclosure practices without delving deeply into how these disclosures may affect the financial outcomes of companies like Allianz Group.

Theoretical framework shows that the current study builds on the resource-based view (RBV) of the firm and stakeholder theory. The RBV affirm that firms can achieve a competitive advantage by leveraging intangible resources, such as a strong corporate reputation and employee satisfaction, which can be nurtured through effective ESG strategies Branco et al. (2006). Stakeholder theory, as applied in this research, and also presented in the study of Porter et al. (2018) suggests that companies must balance the interests of multiple stakeholders, including shareholders, employees, customers, and the broader community with the result of optimzing both corporate responsibility and profitability.

To conclude, this literature review highlights the complex and varied relationship between ESG and financial performance. Even though ESG factors integration is generally viewed as a pathway to improving long-term profitability, the evidence remains mixed, particularly in the insurance industry. In this study we aim to fill the gap by focusing on the Allianz Group and analyzing how different ESG factors affect the financial performance indicators. By doing this we seek to provide a deeper understanding of the potential synergies and trade-offs between profitability and corporate responsibility.

Methodology

The data used in this study focuses on both financial performance and ESG indicators of Allianz Group over a period of 5 years. Allianz Group, a global leader in the insurance and asset management industry, is known for its strong commitment to sustainability and corporate responsibility. The company has shown consistent integration of ESG principles into its business strategy and positioning itself as a key player in promoting sustainability in the financial sector. In this study we specifically use Allianz's publicly available sustainability and financial reports, which provide a comprehensive overview of the company's performance in these domains.

In terms of different indicators used for the analysis we've used a variety of financial key indicators that will provide a deeper understanding of the connection between our main factors. Therefore you will find below briefly explanations of the indicators used.

Starting with the first financial indicator, revenue refers to the total income generated by the company from its various business activities, including insurance premiums and investment income. It's an important metric in assessing the overall scale and financial health of the company. Allianz's revenue figures provide insight into the market demand for its insurance and asset management services.

Continuing with the operating profit which is a key measure of a company's profitability from its core operations, excluding extraordinary items and income from non-operating activities. This indicator is essential for evaluating the company and in our case, Allianz Group's operational efficiency and cost management practices.

The RoE indicator or return on equity stands as a profitability ratio that measures the ability of Allianz to generate profits from its shareholders' equity. A higher RoE indicates efficient use of capital in generating profit, and it is the most critical indicator for investors looking to assess the company's financial returns relative to its equity base.

The Combined Ratio stands as an important metric in the insurance industry that measures the underwriting profitability of an insurance company. It is defined as the sum of the loss ratio (claims paid out compared to premiums earned) and the expense ratio (operating expenses compared to premiums earned). A ratio below 100% indicates underwriting profitability, meaning the company is earning more in premiums than it is paying out in claims and expenses.

The Earnings per share or EPS represents the portion of a company's profit allocated to each outstanding share of common stock. It is a key indicator of Allianz's profitability on a per-share basis and is widely used by investors to assess the company's financial performance and compare it to industry peers.

The Greenhouse Gas Emissions or GHG emissions data reflects the environmental impact of Allianz Group's operations, specifically focusing on the emissions of carbon dioxide (CO_2) and other greenhouse gases. It plays an important part to track these emissions for a better understanding of the company's efforts in mitigating climate change, in line with global sustainability goals.

Another ESG indicator is the renewable energy usage data indicates the percentage of Allianz's energy consumption derived from renewable sources such as solar, wind, and hydroelectric power. This data is crucial in evaluating the company's commitment to reducing its carbon footprint and advancing its environmental sustainability initiatives.

The (dNPS) or the dynamic net promoter score is a metric usually used to assess customer loyalty and satisfaction. It measures the likelihood of Allianz's customers recommending the company's services to others. It also plays an important role as a higher dNPS suggests strong customer satisfaction and indicates a positive relationship with clients, which is integral for maintaining long-term business success.

Following with the employee satisfaction index, this indicator reflects the overall satisfaction of Allianz's employees with their work environment, compensation, and job conditions. This index is a key social indicator, highlighting Allianz's commitment to fostering a positive and productive workplace culture. Usually a higher score in this index correlates with lower turnover, higher employee engagement, and improved company performance.

The DJSI or Dow Jones sustainability index stands as a global benchmark that evaluates companies based on their sustainability practices. Allianz's rank in this index is an important indicator of its relative performance in terms of sustainability compared to other firms.

Last but not least, the solvency II ratio indicator measures the financial stability of an insurance company. It compares a company's available capital to the capital required to cover potential risks. A high solvency II ratio usually indicates strong financial health and resilience, ensuring that Allianz can meet its long-term obligations and continue operating in the event of adverse financial conditions.

For this project the analysis period chosen was over a period of 5 years from 2019 to 2023 period that provides a comprehensive snapshot of Allianz Group's performance. Over this period, Allianz has navigated a rapidly changing financial landscape, influenced by the COVID-19 pandemic, shifts in market conditions, and increasing pressure for companies to adopt sustainable business practices. The data collected from these years allows an in-depth analysis of how the company financial performance interacts with its corporate responsibility initiatives, particularly focusing on the implementation and outcomes of ESG strategies.

The company that was chosen for the analysis is Allianz Group, headquartered in Munich, Germany, one of the world's largest and most prominent insurance and financial services companies. Allianz operates in more than 70 countries and provides a large range of services including property and casualty insurance, life and health insurance, asset management, and retirement solutions.

During this period, Allianz stands as a devoted partner in its efforts of integrating ESG factors into its business model. The company is focused on enhancing its sustainability practices, reducing its environmental impact, and increasing stakeholder engagement through improved customer and employee satisfaction initiatives. Financially, during this period, Allianz faced market challenges but has demonstrated resilience, with stable revenue generation and solid profitability metrics, underscoring the potential long-term benefits of its ESG strategies.

Table 1. Dates and indicators

Nr. crt.	Indicators used in analysis	Measure units	Acronym	Source of data
1.	Revenue	(€ mil.)	REV	Allianz annual report (2019-2023)
2.	Operating Profit	(€ mil.)	OP	Allianz annual report (2019-2023)
3.	RoE	(%)	RoE	Allianz annual report (2019-2023)
4.	Combined Ratio	(%)	CombRatio	Allianz annual report (2019-2023)
5.	Earnings Per Share	(€)	EPS	Allianz annual report (2019-2023)
6.	GHG Emissions	(mil. t)	GHG	Allianz Sustainability report (2019-2023)
7.	Renewable Energy	(%)	RE	Allianz Sustainability report (2019-2023)
8.	Dynamic Net Promoter Score	(%)	dNPS	Allianz Sustainability report (2019-2023)
9.	Employee Satisfaction Index	(%)	IMIX	Allianz Sustainability report (2019-2023)
10.	Dow Jones Sustainability Index Rank	rank	DJSI Rank	Allianz Sustainability report (2019-2023)
11.	Solvency II Ratio	(%)	Solv	Allianz Sustainability report (2019-2023)

Source: authors' conceptualization.

For the analysis of the relationship between ESG factors and the company's profitability, three multiple linear regression models (OLS - Ordinary Least Squares) will be constructed as follows:

Model 1: $OP = \beta_0 + \beta_1 RE + \beta_2 dNPS + \beta_3 IMIX + \varepsilon$

Model 2: $RoE = \beta_0 + \beta_1 dNPS + \beta_2 Solv + \beta_3 GHG + \varepsilon$

Model 3: $EPS = \beta_0 + \beta_1 dNPS + \beta_2 RE + \beta_3 Solv + \varepsilon$

To check the robustness of the results obtained by the OLS method and to counteract the potential effects of the small sample size, we decided that a robust regression method should also be implemented using the rlm() function from the MASS package in R. Robust regression is less sensitive to extreme values and provides more stable estimates of the coefficients when the sample size is small. This complementary approach allows the validation of the relationships identified by the classical OLS method.

The choice of multiple linear regression models was based on economic theory, specialized literature (Chouaibi, Chouaibi & Rossi, 2021), and the dynamics observed within companies regarding the relationship between ESG factors and profitability. Each model is constructed to capture the impact of relevant ESG variables on different measures of financial performance. Since the descriptive statistics analysis of the data (Table 2) revealed that the data is not normally distributed, a logarithmic transformation was applied to them (Table 3).

Table 2. Descriptive Statistics (Original Variables)

	vars	n	mean	sd	median	trimmed	mad	min	max	range	skew	kurtosis	se
REV	1	5	149.14	8.54	148.51	149.14	9.11	140.46	161.70	21.24	0.34	-1.77	3.82
OP	2	5	12.98	1.65	13.40	12.98	2.00	10.75	14.75	4.00	-0.24	-1.98	0.74
RoE	3	5	12.38	2.40	11.40	12.38	1.63	10.30	16.00	5.70	0.49	-1.77	1.07
EPS	4	5	17.78	2.24	16.48	17.78	0.77	15.96	21.20	5.24	0.54	-1.75	1.00
GHG	5	5	0.21	0.08	0.20	0.21	0.10	0.14	0.29	0.16	0.07	-2.20	0.03
RE	6	5	75.40	25.50	77.00	75.40	34.10	43.00	100.00	57.00	-0.13	-2.08	11.40
dNPS	7	5	70.00	11.64	70.00	70.00	16.31	58.00	84.00	26.00	0.05	-2.12	5.21
IMIX	8	5	77.80	2.95	78.00	77.80	1.48	73.00	81.00	8.00	-0.59	-1.31	1.32
Solv	9	5	207.00	4.06	207.00	207.00	2.97	201.00	212.00	11.00	-0.25	-1.58	1.82

Source: processed by the authors in R 4.2.2.

Table 3. Logarithmic Transformation of Data

	Year	REV	OP	RoE	CombRatio	EPS	GHG	RE	dNPS	IMIX
1	2019	142.369	11.855	13.6	97.6	18.90	0.288	43	70	73
2	2020	140.455	10.751	11.4	99.8	16.48	0.203	57	79	78
3	2021	148.511	13.400	10.6	93.8	15.96	0.139	77	84	78
4	2022	152.671	14.164	10.3	93.8	16.35	0.292	100	58	79
5	2023	161.700	14.746	16.0	93.8	21.20	0.136	100	59	81

	DJSIRank	Solv	log_REV	log_OP	log_RoE	log_CombRatio	log_EPS	log_GHG	log_RE	log_dNPS	log_IMIX	log_Solv
1	1	212	4.958422	2.472750	2.610070	4.580877	2.939162					
2	4	207	4.944887	2.374999	2.433613	4.603168	2.802148					
3	1	209	5.000659	2.595255	2.360854	4.541165	2.770086					
4	3	201	5.028285	2.650704	2.332144	4.541165	2.794228					
5	3	206	5.085743	2.690972	2.772589	4.541165	3.054001					

```
1 -1.244795 3.761200 4.248495 4.290459 5.356586
2 -1.594549 4.043051 4.369448 4.356709 5.332719
3 -1.973281 4.343805 4.430817 4.356709 5.342334
4 -1.231001 4.605170 4.060443 4.369448 5.303305
5 -1.995100 4.605170 4.077537 4.394449 5.327876
```

Source: processed by the authors in R 4.2.2.

To identify the linear relationships between ESG variables and profitability indicators, as well as to detect potential multicollinearity issues that could affect the model estimates and gain a preliminary understanding of the direction and intensity of the relationships between these factors, the correlation analysis between variables will be performed (Table 4).

Table 4. Correlation Analysis for Logarithmized Variables

	log_GHG	log_RE	log_dNPS	log_IMIX	log_Solv	log_RoE	log_OP	log_EPS
log_GHG	1.0000	-0.3975	-0.2790	-0.5892	-0.1380	-0.2841	-0.3254	-0.2156
log_RE	-0.3975	1.0000	-0.5460	0.8950	-0.7915	-0.0589	0.8492	0.0509
log_dNPS	-0.2790	-0.5460	1.0000	-0.3505	0.6154	-0.3885	-0.6353	-0.5360
log_IMIX	-0.5892	0.8950	-0.3505	1.0000	-0.7063	0.0310	0.5876	0.0764
log_Solv	-0.1380	-0.7915	0.6154	-0.7063	1.0000	0.3351	-0.4901	0.2122
log_RoE	-0.2841	-0.0589	-0.3885	0.0310	0.3351	1.0000	0.1879	0.9842
log_OP	-0.3254	0.8492	-0.6353	0.5876	-0.4901	0.1879	1.0000	0.3189
log_EPS	-0.2156	0.0509	-0.5360	0.0764	0.2122	0.9842	0.3189	1.0000

Source: processed by the authors in R 4.2.2.

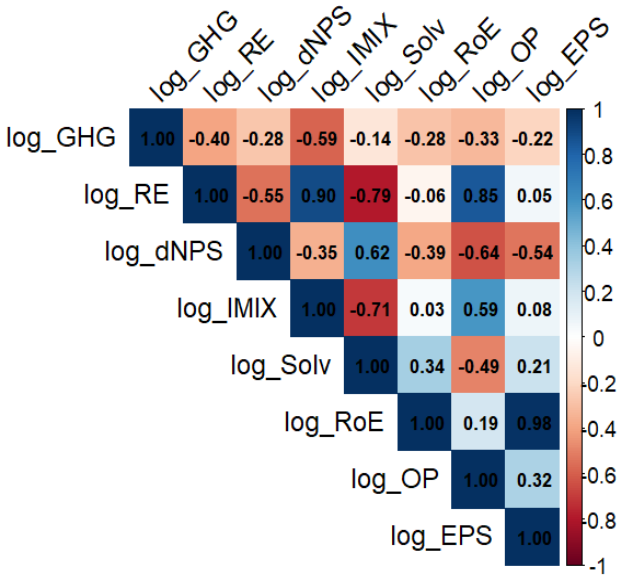

Figure 1. Correlation Matrix

Source: Processed by the authors in R 4.2.2.

The analysis of the correlation matrix (Figure 1) and the correlation table (Table 4) suggests a complex relationship between the selected variables. Thus, it is observed that the transition to renewable energy by the analyzed company, as well as employee satisfaction (IMIX), have a

positive impact on the company's profitability, while potentially affecting solvency. On the other hand, the increase in RE and IMIX is associated with a reduction in greenhouse gas emissions (GHG), which we consider a positive outcome for the analyzed company on its path to sustainability.

On the other hand, customer satisfaction and loyalty measured through dNPS are negatively correlated with profitability and earnings per share (EPS), suggesting that a better balance needs to be maintained between sustainable growth and the company's financial health. Finally, RoE and EPS are strongly correlated with each other, indicating that shareholder performance remains a key indicator of the company's success.

To estimate the regression models, we will use the log-transformed selected variables, which will allow us to interpret the coefficients as elasticities, meaning it will enable us to estimate the percentage change in the dependent variable for a percentage variation in an explanatory variable.

For constructing the three regression models (Model 1, 2, and 3), we will use the company's profitability (measured by OP, ROE, and EPS) as the dependent variable, while the other variables will be considered as explanatory factors. The purpose of constructing the regression models is to test the two research hypotheses set:

H1: The implementation of sustainable environmental practices within Allianz has a significantly positive impact on the company's operational profitability (OP);

H2: The social component of ESG has a positive influence on earnings per share (EPS) and return on equity (RoE) of the company.

Results and discussions

From our tests it's revealed that the 3 estimated models use the ordinary least squares (OLS) method to determine the relationships between the model's variables. In order to evaluate the performance of this 3 selected models, we will analyze the coefficient of determination (R^2 and adjusted R^2), the significance of the coefficients (p-values), and the residual analysis.

We discovered that the findings of this research align with studies shown in other industries. The role of renewable energy in profitability, as seen in Allianz's financial metrics, aligns with conclusions presented by Dracea et. al (2020) who analyze the energy efficiency of EU state members. In the study is underlined that the company investing in energy efficiency measures tend to exhibit stronger financial resilience, fact that is also valid in Allianz's case.

Model for OP (Operating Profit)

```
Call:
lm(formula = log_OP ~ log_RE + log_dNPS + log_IMIX, data = date)
Residuals:
       1        2        3        4        5
 0.02044 -0.04034  0.02076 -0.05545  0.05460
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 12.47407   10.90566   1.144    0.457
log_RE       0.54284    0.33891   1.602    0.355
log_dNPS    -0.06684    0.35480  -0.188    0.881
log_IMIX    -2.74551    2.89544  -0.948    0.517
Residual standard error: 0.09237 on 1 degrees of freedom
Multiple R-squared:  0.8753,      Adjusted R-squared:  0.5012
F-statistic:  2.34 on 3 and 1 DF,  p-value: 0.4401
```

Model for return on equity (log_RoE)

```
Call:
lm(formula = log_RoE ~ log_dNPS + log_Solv + log_GHG, data = date)
Residuals:
       1        2        3        4        5
-0.01026  0.09516 -0.07549 -0.03765  0.02824
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -40.4830    21.2352  -1.906    0.308
log_dNPS     -1.2246     0.5118  -2.393    0.252
log_Solv      8.9648     4.2141   2.127    0.280
log_GHG      -0.2293     0.1824  -1.257    0.428
Residual standard error: 0.1307 on 1 degrees of freedom
Multiple R-squared:  0.8766,      Adjusted R-squared:  0.5063
F-statistic: 2.367 on 3 and 1 DF,  p-value: 0.4379
```

Model for earnings per share (log_EPS)

```
Call:
lm(formula = log_EPS ~ log_dNPS + log_RE + log_Solv, data = date)
Residuals:
       1        2        3        4        5
-0.02823  0.06011 -0.03812 -0.04357  0.04981
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -33.4416    24.1819  -1.383    0.399
log_dNPS     -0.7498     0.3868  -1.938    0.303
log_RE        0.1398     0.2270   0.616    0.648
log_Solv      7.2936     4.5038   1.619    0.352
Residual standard error: 0.1012 on 1 degrees of freedom
Multiple R-squared:  0.8262,      Adjusted R-squared:  0.305
F-statistic: 1.585 on 3 and 1 DF,  p-value: 0.5149
```

Source: Processed by the authors in R 4.2.2.

As observed, the initial results of the regression models indicate high R^2 values (between 0.82 and 0.88), suggesting that the selected explanatory variables manage to capture a significant proportion of the variation in the dependent variables. However, the adjusted R^2 values are considerably lower (between 0.30 and 0.51), and the F-tests indicate a lack of overall statistical significance for the models ($p > 0.4$), which may be influenced by the small sample size analyzed.

Although the preliminary results present limitations in terms of statistical significance, they may still provide a basis for exploring the relationships between the selected variables. To assess the robustness and validity of the constructed models and identify potential improvements, a thorough diagnostic analysis will also be performed. Thus, for model validation, diagnostics will be conducted by checking for multicollinearity, conducting tests for heteroscedasticity, performing autocorrelation tests, and analyzing diagnostic plots.

Multicollinearity check

```
> vif(model_log_OP)
  log_RE log_dNPS log_IMIX
7.276183 1.650133 5.822771
> vif(model_log_RoE)
log_dNPS log_Solv  log_GHG
1.715513 1.612660 1.086587
> vif(model_log_EPS)
log_dNPS   log_RE log_Solv
1.633870 2.718030 3.070668
```

Test for heteroscedasticity

```
bptest(model_log_OP)
        studentized Breusch-Pagan test
data:  model_log_OP
BP = 4.7299, df = 3, p-value = 0.1927
```

```
bptest(model_log_RoE)
        studentized Breusch-Pagan test
data:  model_log_RoE
BP = 4.2048, df = 3, p-value = 0.2402
bptest(model_log_EPS)
        studentized Breusch-Pagan test
data:  model_log_EPS
BP = 1.5392, df = 3, p-value = 0.6733
```


Autocorrelation test

```
> dwtest(model_log_OP)
        Durbin-Watson test
data:  model_log_OP
DW = 2.9708, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0
> dwtest(model_log_RoE)
        Durbin-Watson test
data:  model_log_RoE
DW = 2.6946, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0
> dwtest(model_log_EPS)
        Durbin-Watson test
data:  model_log_EPS
DW = 2.5582, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0
```

Source: Processed by the authors in R 4.2.2.

The results obtained show that Model 1 (OP) exhibits signs of multicollinearity (VIF > 5 for lRE and IMIX), indicating a high correlation between these explanatory variables. However, the Breusch-Pagan tests for all models (p > 0.05) confirm the homoscedasticity of the residuals, thus satisfying one of the fundamental assumptions of regression. On the other hand, the Durbin-Watson tests suggest the presence of potential autocorrelation issues, which are somewhat explainable given the small sample size.

Therefore we believe that, overall, the models partially satisfy the assumptions of linear regression, allowing us to continue the analysis, given the limitations imposed by the available data for the company under analysis. Additionally, the diagnostic plots (Figure 2) confirm the adherence to linear regression assumptions and permit the continuation of the analysis.

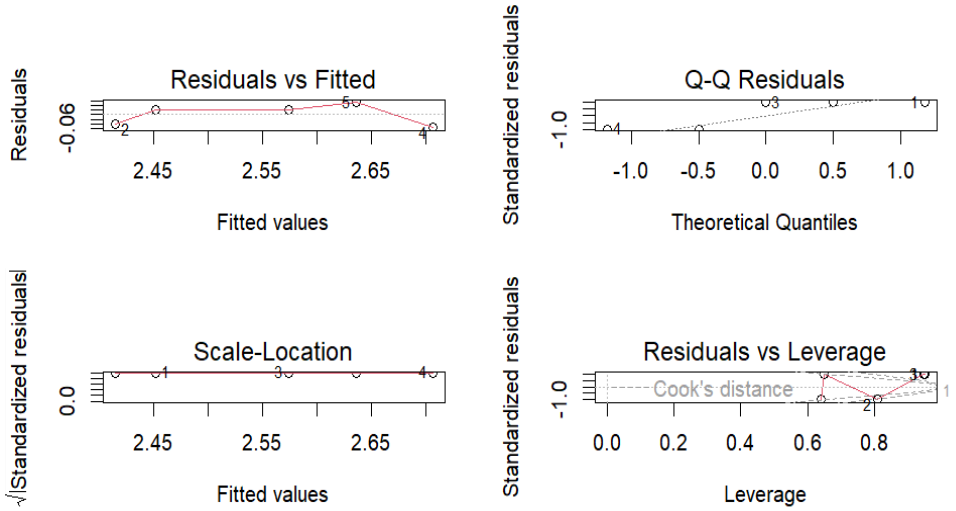

Figure 2. Diagnostic Plots for Model 1

Source: processed by the authors in R 4.2.2.

To visualize the relationships between the variables, we will use graphical analysis of them (Figures 3-5).

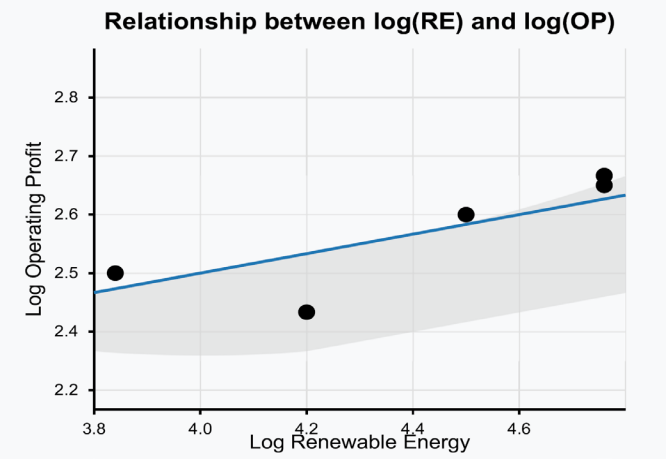

Figure 3. The relationship between ROE and OP

Source: processed by the authors in R 4.2.2.

As seen in Figure 3, there is a positive relationship between the company's transition to renewable sources (measured by RE) and the operational profit achieved by the company. The upward trend suggests that the green energy investments made by Allianz during the analyzed period may contribute to improving its operational financial performance. In Friede et al. (2015) the study synthesizes over 2,000 empirical studies and concludes that, across a broad range of companies and industries, positive environmental performance correlates with better financial performance. In this paper the authors shows that companies with strong ESG strategies, including those that invest in green technologies and renewable energy, tend to outperform their peers in terms of stock price, profitability, and long-term value creation. They provide examples from sectors like energy and manufacturing where companies adopting renewable energy solutions have been able to reduce costs (e.g., through energy efficiency) and access new markets (e.g., green bonds, government subsidies). Allianz's green energy investments are likely improving their operational profitability by lowering energy costs and potentially enhancing their market reputation, as these factors are associated with superior financial outcomes in the broader ESG literature.

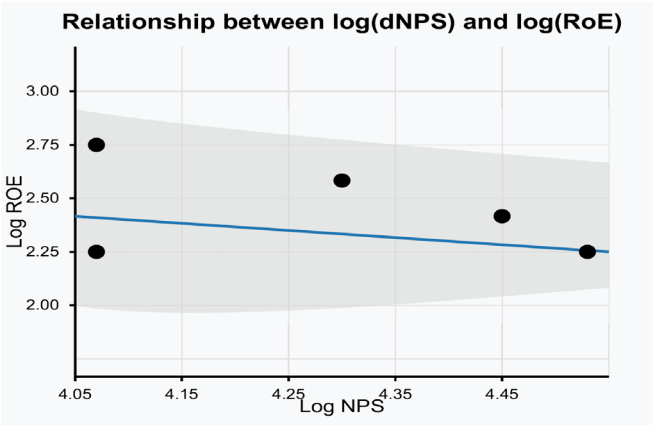

Figure 4. The relationship between dNPS and RoE

Source: processed by the authors in R 4.2.2.

Our analysis on Figure 4 suggests a slight negative relationship between the customer satisfaction indicator and the return on equity. The downward slope of the regression line corresponds to the negative coefficient of the log_dNPS variable in the model for log_RoE. (Eccles et al. 2014) explore how corporate sustainability (including ESG initiatives) affects organizational processes and performance. They find that sustainability practices often lead to improved long-term performance, though not always in the short term. The negative relationship between customer satisfaction and RoE in the analysis might echo this, indicating that efforts to improve customer satisfaction could be a long-term investment that doesn't immediately translate into higher financial returns. This highlights the possibility that improving customer relations (or aligning with sustainability principles) might not always yield immediate financial benefits.

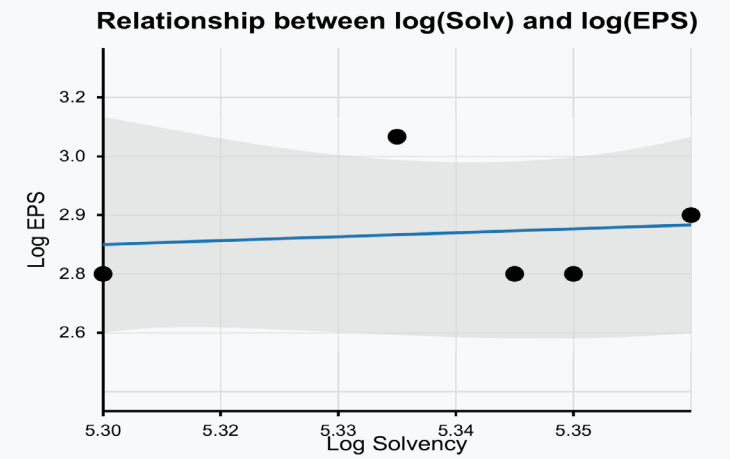

Figure 5. The relationship between Solv and EPS

Source: processed by the authors in R 4.2.2.

The analysis of Figure 5 shows a moderate positive trend between solvency and earnings per share, suggesting that a stronger financial position of the company contributes to better results in the capital market. This visual relationship confirms the positive coefficient of log_Solv in the model for log_EPS.

Before assessing the magnitude of effects through elasticity coefficients, it is essential to validate the robustness of the estimated models, given the small sample size and the possible effects of extreme values.

Table 6. Comparison between OLS and robust regression coefficients for Model 1 (Operating Profit)

Variable	OLS Coefficient	OLS Std. Error	Robust Coefficient	Robust Std. Error
(Intercept)	12.47407	10.90566	12.4741	10.9057
log_RE	0.54284	0.33891	0.5428	0.3389
log_dNPS	-0.06684	0.35480	-0.0668	0.3548
log_IMIX	-2.74551	2.89544	-2.7455	2.8954
Residual std. error	0.09237		0.05981	

Source: processed by the authors in R 4.2.2.

Table 7. Comparison between OLS and robust regression coefficients for Model 2 (Return on Equity)

Variable	OLS Coefficient	OLS Std. Error	Robust Coefficient	Robust Std. Error
(Intercept)	-40.4830	21.2352	-48.4476	0.5630
log_dNPS	-1.2246	0.5118	-1.5828	0.0136
log_Solv	8.9648	4.2141	10.7255	0.1117
log_GHG	-0.2293	0.1824	-0.2655	0.0048
Residual std. error	0.1307		0.001154	

Source: processed by the authors in R 4.2.2.

Table 8. Comparison between OLS and robust regression coefficients for Model 3 (Earnings Per Share)

Variable	OLS Coefficient	OLS Std. Error	Robust Coefficient	Robust Std. Error
(Intercept)	-33.4416	24.1819	-33.4416	24.1819
log_dNPS	-0.7498	0.3868	-0.7498	0.3868
log_RE	0.1398	0.2270	0.1398	0.2270
log_Solv	7.2936	4.5038	7.2936	4.5038
Residual std. error	0.1012		0.0646	

Source: processed by the authors in R 4.2.2.

The results shown from the above tables, it can be seen that models 1 and 3 show identical coefficients between OLS and robust regression, while model 2 (for ROE) shows important differences, with stronger effects of the variables in the robust model and much smaller standard errors. Therefore, the stability of the coefficients between the two methods suggests that the results are not significantly influenced by potential outliers or small sample limitations.

However, in order to see the magnitude of these effects and to estimate the influence of ESG factors on the company's profitability, we will estimate the elasticity coefficients for the three regression models constructed.

Elasticity Coefficients

```
coef(model_log_OP)
(Intercept)      log_RE    log_dNPS    log_IMIX
12.47406540  0.54284111 -0.06684264 -2.74551208
> coef(model_log_RoE)
(Intercept)    log_dNPS    log_Solv     log_GHG
-40.4830013  -1.2245701   8.9647546  -0.2293005
> coef(model_log_EPS)
(Intercept)    log_dNPS      log_RE    log_Solv
-33.4415969  -0.7498226   0.1398258   7.2935813
```

Source: processed by the authors in R 4.2.2.

The results of the elasticity analysis show that solvency has the strongest influence on financial performance. Thus, a 1% increase in solvency is associated with an approximate 9% increase in ROE and a 7.3% increase in EPS, while the use of renewable energy has a positive but rather modest impact on operating profit (0.54%) and EPS (0.14%).

This result suggests that sustainable environmental practices may have a positive impact on operational performance. However, the lack of statistical significance ($p=0.3553 > 0.05$) prevents us from fully validating this hypothesis. Therefore, *H1 is only partially supported by the results*.

As for customer satisfaction (dNPS), it shows a negative relationship with all the profitability indicators analyzed. This negative relationship can be explained by the fact that investments in customer satisfaction require high costs, aggressive pricing strategies, or a delayed impact on revenue.

This result is somewhat contrary to expectations in all the analyzed models and disproves hypothesis H2, suggesting that investments in the social component may have a short-term negative impact on profitability indicators. In (Susen & Etter 2024) we find a similarity in terms of the examination of the ESG impact and its relationship with financial performance. The study says that investments in the social aspects of ESG do not always have yield immediate financial returns and may even hurt short-term profitability due to increased labor costs, training expenses, and community investments. However, these investments tend to improve employee satisfaction, productivity, and long-term firm value. As an example there are companies in the S&P500 that increased the wages and introduced comprehensive employee welfare programs experienced an initial decline in net profit margins before benefiting from reduced turnover and higher productivity.

This negative relationship could be explained by the high costs associated with improving customer satisfaction or by the delayed effects of these investments on financial performance.
The analysis of the elasticity coefficients, in conjunction with the adjusted coefficient of determination (adjusted R^2) for each model, allows us to assess the explanatory power of the models. This is an important aspect of the analysis, as it indicates the proportion of the variation in the dependent variable that is explained by the model, taking into account the number of predictors included.

Adjusted R^2 for each model

```
> cat("Model OP:", summary(model_log_OP)$adj.r.squared, "\n")
Model OP: 0.5011614
> cat("Model ROE:", summary(model_log_RoE)$adj.r.squared, "\n")
Model ROE: 0.5063048
> cat("Model EPS:", summary(model_log_EPS)$adj.r.squared, "\n")
Model EPS: 0.3049687
```

Therefore, it is observed that the model for ROE exhibits the best explanatory performance (adjusted $R^2 = 0.5063$), closely followed by the model for operating profit (adjusted $R^2 = 0.5012$). This suggests that approximately 50% of the variation in ROE and operating profit can be explained by the ESG variables included in the models. The model for EPS has a lower explanatory power (adjusted $R^2 = 0.3050$), indicating that only about 30% of the variation in earnings per share is explained by the included ESG factors.

Comparing the models (Table 5) will thus allow us to evaluate the percentage impact of changes in ESG factors on profitability indicators.

Table 5. Comparison of models using AIC, BIC, and R^2

```
Model       AIC       BIC        R2    R2_adj
1  log_OP -7.677473 -9.630283 0.8752904 0.5011614
2 log_RoE -4.208403 -6.161214 0.8765762 0.5063048
3 log_EPS -6.763635 -8.716445 0.8262422 0.3049687
 (Intercept) (Intercept) 12.47406540      10.9056569  1.1438160
log_RE           log_RE  0.54284111       0.3389075  1.6017382
log_dNPS       log_dNPS -0.06684264       0.3548025 -0.1883940
log_IMIX       log_IMIX -2.74551208       2.8954376 -0.9482201
              p_value
(Intercept) 0.4573568
log_RE      0.3553048
log_dNPS    0.8814541
log_IMIX    0.5169161
```

Source: processed by the authors in R 4.2.2.

The comparison of models using the AIC, BIC, and R^2 criteria indicates that the log_OP model has the lowest AIC and BIC values (-7.68 and -9.63), suggesting superior statistical fit. Meanwhile, the log_RoE model has a slightly higher adjusted R^2 value (0.5063). However, none of the coefficients in the final model reach statistical significance (all p-values > 0.05), thereby limiting the ability to draw firm conclusions about the relationships between ESG variables and company profitability.

Conclusion

The analysis of the relationship between ESG factors and the profitability of Allianz Group for the examined period reveals significant insights for the company's sustainability strategy. These results suggest that Allianz's transition to renewable energy has a positive, albeit moderate, impact on operational profit, indicating that green investments can contribute to operational efficiency and long-term cost reduction. This finding aligns with Allianz's strategic positioning as a leader in integrating sustainability within the insurance and asset management sectors.

Our research shows that our models, which explain almost 50% of profitability variability, suggest for Allianz, the integrating ESG factors is more than just a compliance exercise, it is a significant element of value creation. It's also shown in previous studies of Noja et al. (2023) and Cristea et al. (2024) that highlight the investments of ESG drive financial outcomes across different industries.

Surprisingly, social indicators, particularly customer satisfaction (dNPS), show a negative correlation with profitability. This apparent paradox can be explained by the substantial costs associated with customer experience improvement and digitalization programs implemented by Allianz during the analyzed period, whose financial benefits typically materialize with a delay. For a global insurer of Allianz's scale, investments in customer loyalty should be evaluated over longer time horizons, reflecting policy renewal cycles and the long-term customer value.

Solvency stands out as the factor with the strongest impact on financial indicators, highlighting the fundamental importance of financial stability for Allianz in a sector where trust and resilience are essential assets. This strong connection underscores the compatibility between solid governance and financial performance.

However, several research limitations reduce the robustness of the obtained results. The first identified limitation is the small sample size (five years), which requires cautious interpretation. To reduce the impact of this implementation, the paper also applied a robust regression that provides more reliable results than OLS. The results confirmed that investments in renewable energy positively influence Allianz's operational profitability, while the social factor (dNPS) maintained a short-term negative relationship with financial indicators. Finally, solvency remained the strongest predictor of financial stability.

Another limitation is the presence of multicollinearity among explanatory variables, which can distort coefficient estimations in the constructed models. Although robust regression did not completely eliminate this limitation, it provided more stable estimates of the coefficients. A significant statistical limitation of the study is the inability to robustly test hypotheses due to high p-values (all above the 0.05 threshold) for all estimated coefficients and F-tests of the models. This lack of statistical significance, primarily driven by the extremely small sample size, considerably reduces the power of statistical tests. However, the stability of the coefficients between the OLS and robust methods indicates that the identified relationships are consistent, even if they do not reach the conventional threshold of statistical significance.

Future research will consider extended datasets that could clarify whether the apparent tension between customer satisfaction and short-term profitability transforms into a positive synergy over a longer perspective, thus confirming the alignment of sustainability with financial performance in Allianz's strategy. Also for a better and deeper understanding for future researches there will be a focus on larger sample and a comparison between several companies in the sector, including the elimination of the statistical limitations from the current paper.

Additionally, in light of the identified limitations, future research should incorporate macroeconomic factors as control variables in the models. We will also consider exploring lag models to capture the delayed effects of ESG factors on profitability.

Despite statistical limitations, the models provide valuable insights into possible relationships between ESG factors and the company's financial performance. They allow us to affirm that investments in renewable energy are highly beneficial for the company's operational profitability in the future. Future research will gather different companies from same or different sector to expand the understanding of the effects driven by the ESG to the financial profitability.

As a result of the study, a key takeaway for insurance companies is the need for a strategic approach to ESG integration that balances sustainability initiatives with financial performance objectives. As shown, the renewable energy investments can drive long-term operational efficiency and cost savings, reducing regulatory risks while improving brand reputation and stakeholder trust. However, social responsibility efforts, such as customer satisfaction improvements, require careful financial planning to ensure that the long-term benefits outweigh the short-term costs. Solvency, as a key indicator of financial resilience, reinforces the necessity for insurers to align ESG investments with risk management frameworks, ensuring financial stability while advancing sustainability goals. In the end these insights highlight the importance of embedding ESG considerations into core business strategies to achieve both competitive advantage and long-term value creation.

Overall this study is just the foundation of what needs to be still studied for the relationship between the financial profitability and ESG factors and future data comparison is needed to overcome and adjust the conclusion of a connection between two very important factors within a company today that can result in a way of conducting a more profitable company.

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