

Carbon Neutrality Commitment Announcements and Subsequent Stock Returns

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Abstract

This paper investigates the reaction of the stock market to corporate carbon neutrality (CN) announcements using a global dataset of 887 earnings call disclosures between 2019 and 2024. Employing event-study style comparisons, industry-adjusted returns, and Fama–French factor models, the analysis reveals that CN commitments have limited short-term effects, but are associated with statistically significant negative abnormal returns over a 12-month horizon. The results suggest that investors perceive carbon neutrality pledges as credible signals of future cost burdens rather than value-enhancing strategies. The findings also highlight sectoral and temporal heterogeneity: technology, energy and materials firms exhibit positive return premia, while utilities and real estate underperform; longer-dated CN commitments (post-2040) are priced more favorably than near-term commitments. Regional effects largely disappear once the sector composition is controlled, underscoring the primacy of industry dynamics in shaping market responses.

Keywords: Carbon neutrality; ESG disclosure; stock returns; event study;

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Introduction

Financial markets react not only to currently available material information but also to expectations formed around corporate claims and announcements. In the ESG domain, reactions are asymmetric: negative ESG events depress prices, whereas positive news typically yields limited gains (Capelle-Blancard and Petit, 2017). These effects tend to be short-lived (Vu et al., 2023), and materiality and media visibility amplify market responses

(Serafeim and Yoon, 2021). Institutional actions can also shape valuations (Lindset and Nguyen, 2020). Based on previous evidence that carbon neutrality commitments can induce short-term value losses (Xie et al., 2023), this article examines a global crossindustry sample and evaluates both short- and medium-term stock performance following CN announcements.

Similarly, in ESG markets, investors tend to react not only to material ESG news concerning the company (actual growth of CO₂ emissions, safety and social measures, etc.), but they also assess the sentiment and expectations regarding actions aimed at enhancing the company's sustainability profile. Empirical research consistently shows that market responses to ESG news are asymmetric: negative ESG events depress stock prices, while positive ESG news typically yields limited or no gains. This asymmetry aligns with behavioural finance theories suggesting that investors react more strongly to signals of downside risk. Meta-analyses by (Capelle-Blancard and Petit, 2017) CapelleBlancard and Petit (2019) and (Dorfleitner and Zhang, 2024) report average daily stock price declines of approximately 0.1%-1% following negative ESG events, while positive announcements generate no statistically significant effects. However, these market reactions are short-lived. Vu et al. (2023) find that abnormal returns related to ESG generally reverse within one month, consistent with models of market efficiency and information decay in high-speed markets.

Importantly, the market response depends heavily on the financial materiality of ESG news. According to signalling theory, financially material ESG disclosures affect perceptions of future cash flows and risk, thereby eliciting stronger reactions. Serafeim and Yoon (2021) demonstrate that markets primarily react to unexpected ESG news or news with high media visibility, which signals higher relevance for firm value. They find that positive ESG news leads to 75 basis points higher returns than negative news for firms with low ESG ratings, while the spread narrows to 34 basis points for firms with high ESG ratings, suggesting that expectations play a moderating role. For financially material ESG issues, the reaction spread is 2.81% for low-rated firms and 79 basis

points for high-rated ones, confirming that investors selectively react to news with implications for firm value.

Firm characteristics and regional context further moderate these effects. Companies with strong ESG reputations experience more pronounced market sensitivity, as they are held to higher stakeholder expectations (de Vincentiis, 2023). The study also documents strategic disclosure behaviour, with firms in volatile contexts suppressing negative ESG news and amplifying positive information, especially when reputational risk is high. Moreover, regional differences persist: European markets, where ESG norms and regulatory frameworks are more established, show stronger reactions, whereas Asia-Pacific markets exhibit weaker ESG-related stock price movements (Xu et al., 2022). Firm characteristics and regional context further moderate these effects. Companies with strong ESG reputations experience more pronounced market sensitivity, as they are held to higher stakeholder expectations (De Vincentiis, 2022). The study also documents strategic disclosure behavior, with firms in volatile contexts suppressing negative ESG news and amplifying positive information, especially when reputational risk is high. Moreover, regional differences persist: European markets, where ESG norms and regulatory frameworks are more established, show stronger reactions, whereas Asia-Pacific markets exhibit weaker ESG-related stock price movements (Xu et al., 2022).

Institutional ESG actions can amplify market impacts. Large-scale divestment announcements by influential investors (e.g. Norway's sovereign wealth fund) trigger significant negative abnormal returns, reaching up to -0.52% for targeted firms (Lindset & Nguyen, 2020). These findings reflect institutional investors' capacity to shape market perceptions and signal broader reputational risk.

Xie et al. (2023) extends this literature by examining market reactions to carbon neutrality commitments—a particularly salient form of ESG communication in the context of climate transition risks. The study analyzes 166 firms from major indices (S&P 500, Russell 2000, FTSE 100) making carbon neutrality pledges between 2017 and 2021. Results show that such announcements typically lead to short-term losses in market value, with cumulative abnormal returns (CARs) ranging from -2.09% to -1.21% across various event windows.

This adverse reaction is consistent with trade-off theory (Friedman, 1970), which posits that markets may penalize costly commitments that introduce uncertainty about future profitability. Investors appear concerned about the expected costs of achieving carbon neutrality (e.g.

technological investments, compliance, operational changes). However, the study also finds that better prior ESG performance and higher levels of carbon disclosure can mitigate these negative reactions. Specifically, firms with stronger ESG scores and transparent carbon reporting experienced significantly less negative CARs, supporting the resource-based view, whereby ESG capabilities are seen as strategic assets.

To further develop the last mentioned study, the analysis will extend the scope of the analysis on global stocks universe and on industry-specifics of the market reaction on carbon neutrality commitments of public companies. Given the fact, the strongest market response is experienced by stocks in the following 12 months, the market reaction will be tested on this trading window.

Data

For the purpose of the analysis, the company announcements committing to achieving carbon neutrality of their business operations during their earnings call has been selected. For this, I extracted from Bloomberg database global companies' earnings calls from years 2019-2024 containing keywords "*net zero*", "*carbon neutrality*", "*zero emissions*", "*zero carbon footprint*" together with their possible variations. Then, I have manually filtered claims with clearly stated year of the reaching their own carbon neutral operations. After the extraction, 635 companies has been identified for the sample. In the case, when the company in the tracking period announced carbon neutrality multiple times, only the older announcement was kept in the sample to avoid duplicities. Adversely, when company has readjusted the goal to an earlier year, both records have been input into the testing data. After the following procedures, in total 801 observations has been stored. For each company, the additional characteristics besides the price for a given date were extracted, notably, market cap converted to EUR, P/B ratio, 1Y net operating margin, last year's asset growth, ROBECOSAM ESG score, operating industry and continent. After the extracting the data from last and future 12 months, momenta and future returns were calculated. The same data characteristics were collected for each month of any earnings call of the company from the sample, for the purpose of a control group. On aggregate, 887 CN commitment pledges have been extracted from database.

The counts of CN commitments of the company during the earnings call by each year and by industry and by continent respectively is displayed in Tables 1 and 2.

Table Chyba! V dokumentu není žádný text v zadaném stylu.-1: Frequency distribution of Net Zero Carbon commitments by year and Industry

Industry	2019	2020	2021	2022	2023	2024	All
Communications	0	1	8	5	5	0	19
Consumer Discretionary	0	8	23	19	27	1	78
Consumer Staples	0	3	18	13	9	0	43
Energy	2	12	35	20	10	0	79
Financials	2	4	19	13	6	1	45
Health Care	0	3	13	10	4	2	32
Industrials	2	11	58	40	35	6	152
Materials	3	14	48	44	25	13	147
Real Estate	2	15	31	30	12	5	95
Technology	0	0	13	20	12	1	46
Utilities	13	33	49	31	22	3	151
All	24	104	315	245	167	32	887

Note: Missing values for the Industry field were omitted from the analysis and were treated as NAs.

From both tables it could be seen that the total number of carbon neutrality pledges have peaked in 2021, possibly related to the introduction of The Glasgow Climate Pact at COP28 which called for countries and companies to strengthen their 2030 targets and cement net zero commitments. Another possible factor was the release of the IPCC's Sixth Assessment Report in August 2021 which provided stark warnings about the urgency of limiting global warming to 1.5°C, adding to the importance of stronger net zero commitments.

Table Chyba! V dokumentu není žádný text v zadaném stylu.-2: Frequency distribution of Net Zero Carbon commitments by year and continent

Continent	2019	2020	2021	2022	2023	2024	All
Africa	0	1	2	7	4	4	18
Americas	9	38	130	92	56	4	329
Asia-Pacific	1	14	54	53	41	7	170
Europe	14	52	129	93	66	17	371
All	24	104	315	245	167	32	887

Note: Missing values for the Region field were omitted from the analysis and were treated as NAs..

Table 1 also reveals that industries with the highest CN activity include Industrials, Materials, Utilities, and Energy, i.e. sectors traditionally associated with high carbon footprints. Notably, Industrials and Materials show a clear rising trend in announcements through 2022, indicating industry-level shifts likely driven by regulation, investor pressure, or peer benchmarking. The Utilities sector also demonstrates strong CN momentum, consistent with energy transition narratives. Conversely, sectors like Health Care and Communications contribute fewer CN commitments, potentially due to their lower direct emissions profiles or less ESG scrutiny. Technology, often viewed as a progressive sector, shows surprisingly moderate CN activity.

The following Table 2 reveals that, companies from North America consistently lead in the number of CN announcements, peaking in 2021–2022 and declining afterward. This could be however attributed not only to the ESG narrative in the region, but also to the universe size of the region’s equity market. Europe follows a similar trajectory, though with slightly lower absolute counts. Asia-Pacific’s CN announcements remain stable and significant, reflecting increasing ESG awareness in emerging markets. Africa, though starting from a lower base, shows a notable increase between 2019 and 2022, with a small drop in 2024, which could be however also attributed to the observable time period limited to the May for 2024.

Table 3 presents descriptive statistics of the sample. It could be seen, the average market cap is EUR 14.5 bn indicating a predominance of large-cap firms, in the sample. Furthermore, given the provided data could be observed, dataset is skewed towards highly valued growth stocks with negative operating margin and moderate ESG score. Interestingly, from skim of the dataset could be also seen that for observations with announced CN during the earnings call (CN = 1), the following price change in next months is to some extent lower compared to the price change after the earnings call without any kind of CN announcement (CN = 0).

Table 3: Descriptive statistics of the sample

							Percentiles	
	CN	N	Mean	SD	Minimum	Maximum	25 th	75 th
Market Cap (mil. EUR)	1	887	14524.99	39688.731	0.000	719,205	1952.40	43796.065
P/B Ratio	1	862	11.879	213.1	0.109	6,174.578	1.060	15.001
ESG Score	1	554	4.411	1.366	0.670	8.510	3.485	5.460

							Percentiles	
	CN	N	Mean	SD	Minimum	Maximum	25 th	75 th
Asset Growth	1	805	11.960	38.691	-80.65	513.9	-0.919	12.880
Operating margin	1	807	-6.460	24.545	-49.98	275.2	-30.872	23.343
1M	0	8747	0.140	3.511	-11.906	146.508	-0.777	0.719
	1	887	0.107	1.610	-5.382	13.688	-0.676	0.783
3M	0	8358	0.106	1.057	-3.912	21.012	-0.375	0.456
	1	859	0.077	1.153	-3.619	15.605	-0.347	0.382
12M	0	7169	0.126	0.683	-1.000	22.863	-0.187	0.276
	1	751	0.0379	0.421	-0.983	3.613	-0.207	0.209

Note: This table presents descriptive statistics and selected percentiles for key firm-level variables, comparing companies in time of the earnings call on which carbon neutrality was announced (CN = 1) with times of usual earnings calls.

Results

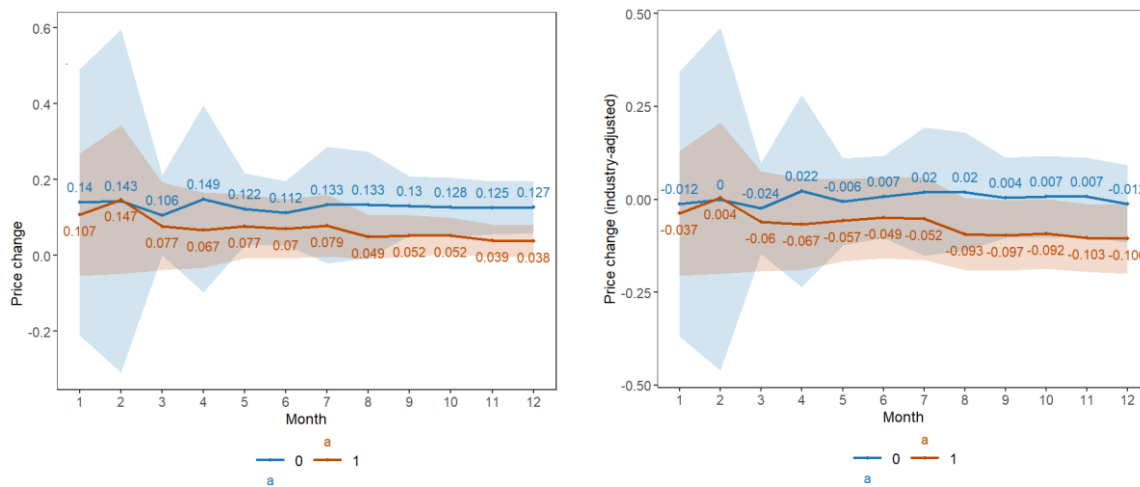
As a further part of exploratory analysis, the annualized returns on month scale from 1-12 months have been analyzed. For the purpose of this and further analyses, the industry-adjusted returns were constructed to control industry specifics, in line with Serafeim and Yoon (2021). Group 1 represents companies that announced a future commitment to carbon neutrality during their earnings calls, while Group 0 serves as a control group consisting of standard earnings calls with no such sustainability announcement.

In terms of gross performance, both groups exhibit similar return profiles in the early months. In month 1, firms with standard earnings disclosures (Group 0) slightly outperform CN-announcing firms (Group 1) at 0.14% versus 0.11%, albeit with much higher return volatility (SD = 3.51 vs. 1.61). From month 2 to month 6, mean returns remain relatively close across groups, but by month 8 onward, Group 1 exhibits a consistent drop-off in gross returns. For example, by month 12, the average return of CN announcers is only 0.04%, compared to 0.13% for non-announcers. This suggests that the initial market response to carbon neutrality announcements is neutral to mildly positive, but the relative performance diminishes over time, potentially reflecting investor uncertainty about the financial implications or execution feasibility of long-term ESG goals.

The industry-adjusted performance provides more pronounced insight. Firms announcing CN commitments underperform their sector peers across nearly the entire post-announcement window.

While Group 0 maintains returns close to industry averages (hovering near 0%), Group 1 shows persistent negative abnormal returns, reaching -0.11% by month 12. This pattern suggests that, although the gross market does not harshly penalize CN announcements, investors recalibrate expectations downward when adjusting for sector benchmarks. Moreover, Group 1's lower volatility in adjusted returns indicates more uniform sentiment—interpreted as either skepticism or conservative valuation of ESG pledges that lack immediate financial materiality.

Figure 1: Market reaction after the standard earnings call (Group 0) and earnings call connected with carbon neutrality pledge (Group 1)



Note: This table presents immediate market reaction on announcement of carbon neutrality on 12months scale, the returns are annualized

The difference in the market response after earnings calls, depending on whether the company announced a carbon neutrality commitment during the call, is further illustrated through an independent-samples t-test on monthly stock returns. As can be seen, from Table 4, statistical relevance is discovered after the ninth month of earnings call. Specifically, the ninth month adjusted return difference reaches statistical significance ($t = 2.45$, $p = 0.014$), with a Cohen's d of 0.09, suggesting a modest but notable effect. This trend gains further statistical strength each month after, being the most significant in the eleventh and month with p -values of 0.007 and 0.022 respectively. The month-returns are annualized and adjusted for industry returns.

Table 4: Independent student test for industry-adjusted month stock performance after the Carbon neutrality call

Dependent Variable	t	df	p	d	95% CI
1M	0.20	9,15	.839	0.01	[-0.06, 0.08]

Dependent Variable	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>	95% CI
2M	-0.02	9,14	.982	-0.00	[-0.07, 0.07]
3M	0.79	8,84	.431	0.03	[-0.04, 0.10]
4M	0.96	8,78	.336	0.04	[-0.04, 0.11]
5M	1.16	8,75	.248	0.04	[-0.03, 0.12]
6M	1.37	8,52	.171	0.05	[-0.02, 0.12]
7M	1.13	8,37	.256	0.04	[-0.03, 0.12]
8M	1.92	8,31	.055	0.07	[-0.00, 0.15]
9M	2.45	8,05	.014*	0.09	[0.02, 0.17]
10M	2.30	7,83	.022*	0.09	[0.01, 0.17]
11M	2.70	7,79	.007**	0.11	[0.03, 0.18]
12M	2.29	7,54	.022*	0.09	[0.01, 0.17]

*Note: This table presents the results of independent samples t-tests comparing industry-adjusted, annualized stock returns between immediate returns after earnings call on which firms announced carbon neutrality (CN) and after a regular earnings call. The column *t* reports the t-statistic. *df* indicates the degrees of freedom associated with each test, *p*-value reflects the two-tailed probability of no difference in means, *d* represents Cohen's *d*. Star symbols *, **, *** highlight statistical significance on a 5%, 1% and 0.1% level.*

The gradual emergence of performance differentials implies a lagged market response to sustainability signaling, possibly reflecting investor skepticism or delayed integration into pricing models. Additionally, the relatively small effect sizes across the board suggest that while the performance effects are statistically significant, they may not be economically large in isolation but could matter in ESG-integrated portfolio strategies.

To further test the hypothesis, the subsequent negative market returns after the carbon neutrality call is related to the ESG activities integration throughout company operations, the moderation analysis on a month, quarterly and yearly basis is conducted. The results are displayed on the Table 5.

Table 5: Moderation analysis of 1M, 3M, and 12M returns after committing to net zero operations of a company after 2030

Variable	Predictor	df	b*	t	p	sr ²	95% CI
M	CN_call	5,984	-0.01	-0.66	.510	.00	[0.00, 0.00]
	ESG_SCORE	5,984	-0.02	-1.13	.257	.00	[0.00, 0.00]
	CN_call × ESG_SCORE	5,984	0.00	0.28	.778	.00	[0.00, 0.00]
Q	CN_call	5,583	-0.02	-1.34	.179	.00	[0.00, 0.00]
	ESG_SCORE	5,583	-0.02	-1.84	.066	.00	[0.00, 0.00]
	CN_call × ESG_SCORE	5,583	-0.01	-0.97	.333	.00	[0.00, 0.00]
Y	CN_call	4,345	-0.04	-3.36	.001***	.00	[0.00, 0.01]
	ESG_SCORE	4,345	-0.05	-3.66	< .001***	.00	[0.00, 0.01]
	CN_call × ESG_SCORE	4,345	0.01	0.86	.391	.00	[0.00, 0.00]

Note: The analysis covers three return windows: 1-month (M), 3-month (Q), and 12-month (Y). The column b reports the unstandardized regression coefficient, t is the associated t-statistic, p is the two-tailed p-value for the null hypothesis of no effect, and sr² represents the semi-partial R². Interaction terms (CN_call × ESG_SCORE) test whether the relationship between CN announcements and returns varies depending on ESG performance. Star symbols *, **, *** highlight statistical significance at the 5%, 1%, and 0.1% levels.

For the short-term horizons (1M and 3M), none of the predictors or their interaction show statistically significant effects on returns, with coefficients near zero and negligible explanatory power. The value of ESG score approaches marginal significance at 3 months (p = 0.066), suggesting a weak negative relationship with returns, but overall, neither net zero commitment nor ESG performance meaningfully influence short-term returns.

In contrast, at the 12-month horizon, both the CN call and ESG score exhibit significant negative effects on returns (p = 0.001 and p < 0.001, respectively), indicating that firms committing to net zero later and those with higher ESG scores tend to have lower annual returns. However, the interaction between CN_call and ESG_SCORE is not significant, implying that ESG performance does not moderate or amplify the impact of net zero commitment on returns.

To extend the analysis further and control for traditional Fama-French risk factors, the OLS regression model was conducted, Table 6 reports linear regression results for three time horizons: 12-month (Y), 3-month (Q), and 1-month (M) returns. Each model controls for Fama-French factors with robust standard errors employed. The following model was therefore constructed in the form:

$$R_{n,j} = \alpha_{n,j} + \sum_{i=1}^J Z_{x,n,j} + CN_call_{n,j} + \varepsilon_n$$

Where $R_{n,j}$, represents subsequent annualized 1M, 3M and 12M return, $Z_{x,n,j}$ represents control factors and $CN_call_{n,j}$, is a dummy variable recording an earnings call with announced CN commitment.

As can be seen from results, market returns provide the highest statistical significance across all models, with coefficients above 1, indicating slightly volatile sample of the equity market in the testing group. Interestingly, from another F-F risk factors, only asset growth and profitability is relevant for tested sample and time period. For industry-adjusted returns, also the momentum is significant. It could be further seen that the dummy variable for the detection of the earnings call related to the carbon neutrality call is still significant on a 0.1% level even after the controlling for risk factors for a market response on 12M basis. The market response for 1M and 3M are, in line with t-test and moderation analysis insignificant. The relatively low R^2 values across models are expected, given the inherently noisy nature of equity returns and the consistency of the negative value carbon commitment variable in the 12M window further strengthens the argument that investors reflect the net zero commitment of the company into their valuation analysis and associate them with future cost burdens or operational constraints that are not expected to be compensated by sufficient return within the foreseeable investment horizon..

Table 6: OLS regression model and coefficients for 12M, 3M and 1M returns controlled for Fama-French factors.

	Gross performance			Industry-adjusted performance		
	Y	Q	M	Y	Q	M
(Intercept)	0.131*** (0.035)	0.037 (0.047)	-0.228 (0.139)	0.045 (0.054)	-0.029 (0.055)	-0.321* (0.143)
Market return	1.408*** (0.137)	4.260*** (0.193)	7.759*** (0.576)	0.535* (0.209)	3.534*** (0.223)	7.035*** (0.587)
size	-0.001 (0.004)	0.005 (0.005)	0.035* (0.016)	-0.004 (0.006)	0.000 (0.006)	0.032+ (0.017)
value	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.001)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.001)
momentum	0.021 (0.057)	-0.107 (0.080)	0.412 (0.239)	-0.763*** (0.088)	-0.819*** (0.094)	-0.236 (0.245)
Op. margin	0.000 (0.000)	0.000** (0.000)	-0.001*** (0.000)	0.000* (0.000)	0.000*** (0.000)	-0.001*** (0.000)
Δ assets	0.000***	0.000**	0.000	0.000***	0.000*	0.000

	Gross performance			Industry-adjusted performance		
	Y	Q	M	Y	Q	M
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CN call	-0.109***	-0.043	-0.060	-0.129**	-0.067	-0.088
	(0.027)	(0.038)	(0.113)	(0.043)	(0.045)	(0.117)
Num.Obs.	7108	8371	8780	6857	8120	8419
R2	0.022	0.057	0.025	0.015	0.041	0.021

*Note: this table presents the results of OLS regression models estimating stock return performance over three time horizons: 1-month (M), 3-month (Q), and 12-month (Y), using both gross and industry-adjusted returns as dependent variables. The upppervalue for each factor refers to the unstandardized regression coefficients, the lower value in parentheses represents standard errors. The variable CN call is a binary indicator for whether a firm announced a carbon neutrality (CN) target during the earnings call. The model controls for Fama-French-style risk factors: Market return general market return (either STOXX600 or industry ETF performance) during the observed period; size reflects the log of the firm's market capitalization, value refers to the P/B ratio; Op. margin stands for operating margin; and Δ assets denotes year-over-year asset growth, indicating investment activity. Star symbols *, **, *** highlight statistical significance at the 5%, 1%, and 0.1% levels*

Impact of company's ESG activities and carbon neutrality year

The regression analysis presented in Table 7 provides further insights into the relationship between the subsequent price change depending on the ESG characteristics of announcer. In the regression model, the ESG score of the announcer was added. The reason, why the ESG score was not added in the model before is that relatively low coverage (62.4%) of ESG-rated companies in the sample. Moreover, a small part of the ESG-rated universe has not been covered for the whole period, which would result in the total relative loss of 40% of dataset. For robustness purposes, the dummy variable tracking whether the announced year for CN is over 2040 (variable *CN_2040*; ca. 50% of all CN announcements) was incorporated in the model. The rationale for this inclusion is to examine whether the temporal distance of commitment influences investor perception and subsequent price reactions. Results of the regression analysis are demonstrated in table below.

Table 7: Comparison of regression analyses on a 12M basis without (0) and with (1) ESC Score variable included

	Gross Performance		Industry-adjusted performance	
	(1)	(2)	(1)	(2)
(Intercept)	0.131***	0.307***	0.043	0.213*
	(0.035)	(0.046)	(0.054)	(0.084)
Market return	1.410***	1.576***	0.559**	-0.364
	(0.137)	(0.128)	(0.209)	(0.229)
Size	-0.001	-0.002	-0.004	-0.003
	(0.004)	(0.004)	(0.006)	(0.008)
Value	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Momentum	0.022	-0.146**	-0.755***	-0.996***
	(0.057)	(0.055)	(0.088)	(0.099)

	Gross Performance		Industry-adjusted performance	
	(1)	(2)	(1)	(2)
Op. margin	0.008 (0.000)	-0.001 (0.000)	0.007t (0.000)	0.000 (0.000)
Δ assets	0.000*** (0.000)	0.000 (0.000)	0.000*** (0.000)	-0.001+ (0.000)
CN call	-0.119*** (0.036)	-0.085* (0.039)	-0.243*** (0.056)	-0.151* (0.071)
CN_2040	0.024 (0.052)	-0.048 (0.053)	0.258** (0.082)	0.267** (0.096)
ESG_SCORE		-0.028*** (0.006)		-0.036** (0.012)
Num.Obs.	7108	4199	6857	4161
R2	0.022	0.045	0.017	0.030

*Note: this table presents the results of OLS regression models estimating stock return performance over three time horizons: 1-month (M), 3-month (Q), and 12-month (Y), using both gross and industry-adjusted returns as dependent variables. The upper value for each factor refers to the unstandardized regression coefficients, the lower value in parentheses represents standard errors. The variable CN call is a binary indicator for whether a firm announced a carbon neutrality (CN) target during the earnings call. The model controls for Fama-French-style risk factors: Market return general market return (either STOXX600 or industry ETF performance) during the observed period; size reflects the log of the firm's market capitalization, value refers to the P/B ratio; Op. margin stands for operating margin; and Δ assets denotes year-over-year asset growth. indicating investment activity., CN_2040 is a dummy variable indicating, the carbon neutrality deadline was set later than 2040. ESG score is a raw ROBECOSAM score of a company at the time of earnings call. Star symbols *, **, *** highlight statistical significance at the 5%, 1%, and 0.1% levels.*

In terms of the impact of ESG scores, a significant negative relationship could be seen when in the models, with coefficients of -0.028 and -0.036 for gross and industry-adjusted performance, respectively. This finding is in line with results obtained in 5.1. supporting the hypothesis of Pástor (2019) serving ESG activities of the company as an climate-risk hedge, which thus lowers financing costs. Also, it could be seen that after the conjoint effect of lowering the data sample and controlling ESG score, the risk factors *investment* and *profitability* is no longer statistically relevant. The momentum variable however still stays relevant, indicating the return to the mean characteristics of the stock market in the observed data.

Furthermore, the regression results show that CN commitment year is statistically significant and positively associated with 12-month industry-adjusted returns, with a coefficient of 0.267 on the 1% level. This finding suggests that the impact of expected burden of costs related to fulfilling CN obligations is moderated by the greater discounting factor of the costs expected in the later years. It could however be also suggested that investors may perceive longer-term climate goals as more strategic, less disruptive to short-term profitability, and better aligned with long-term business models. Interestingly, while the CN_2040 is not statistically significant in the gross return model, its significance appears only when controlling for industry-adjusted performance,

reinforcing the idea that the observed effect is not driven by sectoral dynamics but by firm-specific characteristics and market perception of announcement credibility and timing.

Industry and region effect

To dive deeper in the sectoral and regional dynamics exploration of effect of CN calls on the price change, the regression model was extended for industry and regional specific-effects. The *Industry* category was collected according to Bloomberg Industry Classification Standard, while regional component consists of the continent of a headquarters for a given company. Thus, the multilevel mixed effects model was created in the form:

$$R_{n,j} = \alpha_{n,j} + \sum_{x=1}^X Z_{x,n,j} + CN_{call_{n,j}} + \alpha_k + \gamma_l + \varepsilon_n$$

Where α_k represents industry-specific intercepts, $Z_{k,n,j}$ is x-set of risk-factor parameters for j-th company in n-th time, and γ_l is the regional-specific intercept for j-th company. The results are shown in Table 8.

Table 8: Regression results: Reagional vs. Industrail specific effect

	Regional-specific effects	Regional and Industrial-specific effects
(Intercept)	0.345** (0.127)	0.127 (0.095)
Market	0.579** (0.209)	1.415*** (0.136)
Size	-0.008 (0.006)	-0.005 (0.004)
Value	-0.000 (0.000)	-0.000 (0.000)
month_change	-0.762*** (0.088)	0.001 (0.057)
Operating MARGIN	0.000+ (0.000)	0.000 (0.000)
ASSET GROWTH (12M)	0.000*** (0.000)	0.000*** (0.000)
CN_call	-0.131** (0.043)	-0.091*** (0.027)
ContinentAmericas	-0.278* (0.117)	-0.004 (0.077)
ContinentAsia-Pacific	-0.128 (0.120)	0.076 (0.078)
ContinentEurope	-0.314** (0.118)	-0.030 (0.076)
IndustryConsumer Discretionary		0.019 (0.053)
IndustryConsumer Staples		-0.050 (0.056)

	Regional-specific effects	Regional and Industrial-specific effects
IndustryEnergy		0.102* (0.051)
IndustryFinancials		-0.003 (0.054)
IndustryHealth Care		0.090 (0.062)
IndustryIndustrials		0.083+ (0.049)
IndustryMaterials		0.111* (0.049)
IndustryReal Estate		-0.128* (0.053)
IndustryTechnology		0.123* (0.053)
IndustryUtilities		-0.066 (0.050)
Num.Obs.	6857	7108
R2	0.020	0.041

*Note: this table presents the results of OLS regression models estimating stock return performance over three time horizons: 1-month (M), 3-month (Q), and 12-month (Y), using both gross and industry-adjusted returns as dependent variables. The upper value for each factor refers to the unstandardized regression coefficients, the lower value in parentheses represents standard errors. The variable CN call is a binary indicator for whether a firm announced a carbon neutrality (CN) target during the earnings call. The model controls for Fama-French-style risk factors: Market return general market return (either STOXX600 or industry ETF performance) during the observed period; size reflects the log of the firm's market capitalization, value refers to the P/B ratio; Op. margin stands for operating margin; and Δ assets denotes year-over-year asset growth, indicating investment activity. Star symbols *, **, *** highlight statistical significance at the 5%, 1%, and 0.1% levels*

In the industry-adjusted return model, geographic origin continues to explain a significant portion of firm-level return variation, even after stripping out industry-wide effects. Firms located in Europe and North America exhibit statistically significant negative coefficients, with Europe showing the largest regional discount (greater than -0.3). A negative coefficient in this context implies that, all else equal, firms from these regions tend to generate lower returns relative to the benchmark region, after accounting for their sector exposure. This suggests a consistent investor discount applied to firms operating in more mature, possibly more regulated or less growth-oriented markets. The Asia-Pacific region also shows a negative, albeit weaker, coefficient, indicating a similar but less pronounced pricing effect. These findings point to a residual pricing mechanism in equity markets where geography matters independently of sector, possibly capturing regional risk premia, institutional frictions, or macroeconomic uncertainty not fully reflected in fundamental firm characteristics.

In the full model that includes both regional and industry fixed effects, the structure of return premia shifts decisively toward sector-level dynamics. Several industries show positive and statistically significant coefficients, indicating that firms in those sectors consistently outperform the baseline. For instance, the coefficient for Technology exceeds $+0.12$, suggesting that—holding

market returns and firm fundamentals constant—investors assign a return premium to technology firms, likely due to their perceived innovation, scalability, and long-duration growth prospects. Similarly, Materials and Energy sectors also receive a positive pricing premium, possibly reflecting their exposure to global inflation cycles or supply constraints. In contrast, Real Estate and Utilities display statistically significant negative coefficients, with Real Estate falling below -0.12 . A negative coefficient here means that these firms tend to generate lower market-aligned returns, which can be interpreted as investors demanding a risk discount due to their interest rate sensitivity, balance sheet rigidity, or declining long-term outlook. The interpretation of these coefficients is clear: sector affiliation is not just a control variable—it's a pricing signal that reflects structural economic narratives embedded in investor expectations.

Once industry exposure is accounted for explicitly, regional effects diminish substantially, both in magnitude and statistical significance. The coefficients for North America and Europe shrink to negligible levels (below -0.03), and become statistically insignificant, suggesting that the earlier observed underperformance was largely attributable to their sectoral composition—particularly underweighting in high-performing sectors like Technology or overweighting in lagging sectors like Real Estate. By contrast, the Asia-Pacific region retains a small, positive coefficient (0.08) that is marginally significant, indicating some residual investor optimism or structural advantage not entirely explained by sector mix. Overall, these findings suggest that while geography may matter in sector-adjusted models, its explanatory power weakens considerably in fully specified models, reinforcing the interpretation that investors primarily differentiate expected returns along sectoral rather than regional lines. From a coefficient perspective, this means that sector dummies absorb much of the systematic variation, leaving geography as a secondary, often non-significant, layer of differentiation.

Conclusions

The performed analysis of firms' carbon neutrality (CN) commitments reveals that, despite initial expectations of a positive market response, the effect of CN announcements is either statistically insignificant in the short term or moderately negative in the medium to long term. While the gross market returns do not penalize CN-announcing firms immediately, the industry-adjusted models display a consistent underperformance of such firms relative to their sector peers. These findings suggest that the capital markets, on average, do not attribute excess returns to carbon neutrality pledges and may, in fact, price in anticipated costs or uncertainties associated

with long-term sustainability commitments. The statistical significance of the CN_call variable across 12-month windows further supports the interpretation that investors treat carbon neutrality announcements as credible signals, but ones potentially entailing future financial burdens.

The interaction between ESG scores and CN announcements does not demonstrate a moderating effect on returns, implying that the degree of ESG maturity does not significantly alter the way markets price sustainability commitments in the observed period. Although ESG scores themselves exhibit a negative and statistically significant association with long-term stock performance, the evidence points to their interpretation as a proxy for lower cost of capital rather than a source of return enhancement. Interestingly, the temporal dimension of the CN commitment does appear to matter. Announcements targeting years beyond 2040 correlate positively with industry-adjusted returns, suggesting that longer-dated pledges are perceived as less disruptive and more strategically aligned. This supports the hypothesis that investors discount the costs of carbon neutrality commitments more favorably when they are projected further into the future.

The sectoral and regional dimensions of the market response reveal further nuances. Industry effects are particularly strong: firms in technology, energy, and materials benefit from a consistently positive return premium, while real estate and utilities exhibit negative return effects, reinforcing structural market narratives about growth expectations and regulatory risk. Regional differences, on the other hand, diminish substantially when sector exposure is controlled for. The initial underperformance of European and North American firms becomes statistically irrelevant in the full model, indicating that geography alone does not sufficiently explain market behavior toward CN announcements. This highlights the primacy of industry affiliation over regional context in shaping investor expectations around climate-related disclosures.

Despite the statistical rigor of the models employed, the study is not without limitations. The reliance on earnings calls for CN pledge detection, while methodologically consistent, may overlook informal or strategic disclosures occurring outside earnings season. Furthermore, only a subset of firms included in the sample was covered by ESG rating providers, potentially introducing sample bias in moderation models. The narrow time frame and limited forward-looking horizon may also restrict the generalizability of the results, particularly in a context where ESG-related valuation dynamics evolve rapidly. Future research may benefit from exploring the long-term pricing of net zero strategies across capital structures, as well as the impact of regulatory

alignment and green financing instruments on investor perception of carbon neutrality announcements.

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