

“Stock market reaction to the announcement of Morocco’s voluntary carbon market: An event study”

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STOCK MARKET REACTION TO THE ANNOUNCEMENT OF MOROCCO'S VOLUNTARY CARBON MARKET: AN EVENT STUDY

Abstract

The growing development of voluntary carbon markets has raised increasing interest in understanding how financial markets respond to climate-related policy announcements, particularly in emerging economies. This study investigates the stock market reaction to the official announcement of the operational launch of Morocco's voluntary carbon market on September 24, 2024. The analysis applies the event study methodology to a sample of the eight largest companies listed on the Casablanca Stock Exchange to estimate expected returns and abnormal returns over an event window of $[-4; +5]$.

The results indicate that the announcement did not generate statistically significant abnormal stock market reactions. On the event day ($t = 0$), the average abnormal return (AAR) was -0.238% ($t = -1.006$; $p = 0.348$), while the cumulative abnormal return (CAR) over the $[-4; +5]$ event window reached 1.00% ($t = 0.615$; $p = 0.550$), indicating the absence of a statistically significant market response. A robustness analysis using an alternative event window $[-3; +3]$ produced similar results ($CAR = 1.52\%$, $t = 1.494$; $p = 0.186$), confirming the stability of our finding.

Overall, the evidence suggests that the operational launch of Morocco's voluntary carbon market did not constitute value-relevant information capable of significantly influencing investors' expectations or short-term market valuation, reflecting the early stage of development of the country's voluntary carbon market.

Keywords

voluntary carbon market, event study methodology,
abnormal returns, stock market reaction, Morocco
environmental finance, Morocco

JEL Classification

G14, G15, Q54, Q56

INTRODUCTION

Ocean acidification, melting glaciers, rising temperatures, rising sea levels, and biodiversity loss are just some of the effects of climate change currently facing the world. In response, governments, international organizations, and businesses are increasingly being called upon to implement policies and mechanisms to reduce greenhouse gas emissions, mitigate their environmental consequences, and limit the carbon footprint of economic activities (IPCC, 2021). In this context, carbon markets have gradually become essential economic instruments for encouraging emissions reductions while promoting the economic efficiency of climate policies (Stavins, 2008). Furthermore, the rise of voluntary carbon markets reflects growing corporate interest in offsetting emissions and strengthening sustainability strategies (Ecosystem Marketplace, 2021). This trend is particularly evident in Africa, where the Africa Carbon Markets Initiatives highlights the significant potential for expanding carbon markets across the continent and for mobilizing climate finance for low-carbon development (Africa Carbon Markets Initiative [ACMI], 2024). From an investor

perspective, the increasing relevance of carbon-related risks also suggests that climate considerations may influence investment decisions and the valuation of firms, particularly as investors become more attentive to companies exposure to carbon risk (Bolton & Kacperczyk, 2021).

As part of this global shift toward a more sustainable economy, several emerging countries have gradually begun implementing policies that promote green finance and environmental transition. Morocco is part of this trend through various initiatives and strategies that promote sustainable development and reduce carbon emissions. Thus, the official announcement of the operational launch of Morocco's voluntary carbon market constitutes a major milestone in the country's transition toward sustainable finance and low-carbon development.

From a financial markets perspective, announcements related to environmental policies and sustainability initiatives may influence investors' expectations and firms' market valuation. According to the Efficient Market Hypothesis, financial asset prices quickly incorporate all available information, so any new information likely to affect companies' economic prospects can cause abnormal fluctuations in stock returns (Fama, 1970). In this regard, the event study methodology is widely used in finance to analyze financial markets' reactions to specific events or public announcements that may influence firm value (MacKinlay, 1997). Furthermore, several empirical studies show that environmental initiatives and corporate social responsibility strategies can influence investor perceptions and, consequently, the valuation of companies in financial markets (Friede et al., 2015).

Building on this context, it is interesting to investigate investors' reactions to the official announcement of the operational launch of Morocco's voluntary carbon market. Using the event study methodology, the analysis examines whether the announcement generated abnormal stock returns among the largest companies listed on the Casablanca Stock Exchange. By providing empirical evidence from an emerging economy, this study contributes to the literature on environmental finance by extending current knowledge on investors' responses to climate-related policy announcements and offering new insights into the financial implications of carbon market initiatives in developing economies.

1. LITERATURE REVIEW

1.1. Carbon markets and carbon credits

Carbon markets are market-based mechanisms designed to reduce greenhouse gas (GHG) emissions by assigning an economic value to carbon emissions and allowing the exchange of emission allowances or carbon credits. They are widely recognized as effective policy instruments for achieving climate objectives while minimizing the economic costs of emission reductions (Stavins, 2008). Through these mechanisms, carbon emissions become tradable assets, creating financial incentives for firms to invest in low-carbon technologies and sustainable practices.

The literature generally distinguishes between compliance (mandatory) carbon markets and voluntary carbon markets. Compliance markets operate under legally binding emission caps set by public authori-

ties, with the European Union Emissions Trading System (EU ETS) as the most prominent example. In contrast, voluntary carbon markets allow companies and individuals to purchase carbon credits on a voluntary basis to compensate for greenhouse gas emissions and support certified emission reduction projects (Forest Peoples Programme, 2023).

A carbon credit represents one metric ton of carbon dioxide (CO₂) equivalent reduced, avoided, or removed from the atmosphere through certified environmental projects. Its market value depends on several factors, including project quality, certification standards, and market supply and demand. In this regard, the ISO 14064 standards provide a structured framework for organization and project proponents to quantify and report GHG emissions and reductions, while supporting the verification of GHG-related claims and facilitating the trading of emission allowances or credits (Weng & Boehmer, 2006).

Beyond their environmental objective, carbon credits have become financial assets that may influence investors' expectations regarding firms' environmental strategies and future economic performance.

1.2. Institutional context of the low-carbon transition in Morocco

Morocco has progressively strengthened its commitment to climate action through their implementation of ambitious environmental policies and sustainable development strategies. Over the past decade, the country has positioned itself as one of Africa's leading actors in the transition toward a low-carbon economy by combining regulatory reforms, renewable energy investments, and international climate commitments.

Several major initiatives have supported this transition. The Nationally Determined Contributions (NDCs) (UNFCCC, 2021b) have progressively increased Morocco's greenhouse gas emission reduction target to 45.5% by 2030, while the Low-carbon Strategy 2050 (UNFCCC, 2021a), adopted in 2022, established a long-term roadmap promoting renewable energy, energy efficiency, sustainable agriculture, and low-carbon territorial development. These efforts have been reinforced by the adoption of Law No.82-21 on electricity self-generation and Law No.49-19 promoting renewable energy development, thereby strengthening the regulatory framework supporting decarbonization.

Within the broader policy framework, a major milestone was reached on September 24, 2024, with the official announcement of Morocco's Voluntary Carbon Market following the signing of a Memorandum of Understanding between the Caisse de Dépôts et de Gestion (CDG) and the Casablanca Finance City Authority (CFCA). This initiative aims to establish a national platform for carbon credit transactions while strengthening Morocco's position as a regional hub for sustainable finance. The subsequent launch of the Green Assets Cluster further illustrates the country's ambition to foster cooperation among public institutions, private investors, and climate finance stakeholders (Gnaoui & Moutahaddib, 2025).

Against this institutional backdrop, the announcement of the Moroccan voluntary carbon market represents an important policy signal that may influence investors' expectations regarding future environmental regulation, corporate sustainability strategies, and long-term business opportunities. Examining the stock market reaction to this announcement therefore provides valuable insights into how financial markets assess emerging climate-related initiatives in an emerging economy.

1.3. Financial markets reactions to environmental announcements

According to the Efficient Market Hypothesis (Fama, 1970), stock prices rapidly incorporate publicly available information, implying that major environmental announcements may generate abnormal returns if they alter investors' expectations regarding firms' future performance. Consequently, the event study methodology has been widely employed to assess the stock market impact of environmental and climate-related announcements.

However, empirical evidence remains mixed. Several studies report positive market reactions, suggesting that environmental policies and sustainability initiatives are perceived as creating long-term value and improving firms' competitiveness (Clark et al., 2015; Friede et al., 2015; Ramiah et al., 2013). In contrast, other studies document weak or statistically insignificant market responses, particularly when environmental initiatives are voluntary, or their economic implications remain uncertain (Fisher-Vanden & Thorburn, 2011).

Overall, the existing literature indicates that investors' reactions depend on the nature of the environmental announcement, its expected financial consequences, and the institutional context in which it is introduced. These heterogeneous findings highlight the need to examine investors' reactions in underexplored contexts, particularly in emerging economies where voluntary carbon markets remain at an early stage of development.

1.4. Research gap and hypotheses

While research on carbon markets and environmental finance has grown substantially, empirical

evidence on investors' response to the announcement of voluntary carbon markets remains scarce, especially in emerging economies. Existing event studies have primarily examined mandatory environmental regulations, climate policies, or corporate sustainability initiatives in developed countries, while evidence on national voluntary carbon market announcements remains rare. To the best of our knowledge, no previous study has investigated the stock market reaction to the operational launch of Morocco's voluntary carbon market.

This study aims to address this gap by examining whether the official announcement of the Moroccan voluntary carbon market generated abnormal stock market returns among the largest companies listed on the Casablanca Stock Exchange. By focusing on an emerging economy undertaking a major climate finance initiative, this paper extends the environmental finance literature and provides new empirical evidence on investors' responses to voluntary carbon market developments.

In light of these gaps, this study addresses the following research question: To what extent did the official announcement of the operational launch of Morocco's voluntary carbon market influence investors' reactions on the Casablanca Stock Exchange?

To answer this research question, the following hypotheses are tested:

- H1: The announcement of the operational launch of Morocco's voluntary carbon market generates statistically significant average abnormal returns (AARs).*
- H2: The announcement of the operational launch of Morocco's voluntary carbon market generates statistically significant cumulative abnormal returns (CARs).*

2. METHODS

This study adopts the event study methodology to investigate the stock market reaction to the announcement of the Moroccan voluntary carbon market. Introduced by Fama et al. (1969) and

later formalized by Brown and Warner (1985) and MacKinlay (1997), the event study approach has become one of the most widely used empirical methods in financial economics for assessing the informational content of corporate, regulatory, and macroeconomic events.

The underlying principle of the event study methodology is that stock prices rapidly incorporate all publicly available information, in accordance with the semi-strong form of the Efficient Market Hypothesis. Consequently, if an announcement conveys economically relevant information, investors adjust their expectations accordingly, generating abnormal stock returns around the announcement date. In contrast, the absence of statistically significant abnormal returns suggests that the event did not provide new value-relevant information or that the information had already been incorporated into market prices.

Event studies have been extensively applied to evaluate the financial impact of environmental regulations, climate policies, carbon pricing mechanisms, sustainability initiatives, and ESG-related announcements. Given that the establishment of a voluntary carbon market constitutes a novel environmental policy in Morocco, the event study methodology offers an appropriate empirical framework for assessing whether investors perceived this announcement as value-relevant for the country's largest publicly listed firms.

2.1. Sample selection

The empirical analysis focuses on a sample of eight (8) companies listed on the Casablanca Stock Exchange. These firms were selected based on their market capitalization and their significant representation in the Moroccan All Shares Index (MASI).

Collectively, they represent major sectors of the Moroccan economy, including banking, telecommunications, construction materials, mining, utilities, and port services. Their substantial market capitalization and weighting in the MASI Index ensure that they adequately capture the reaction of the most influential listed companies to market-relevant information.

Table 1. Characteristics of the sample

Company	Sector	Market Capitalization (MAD bn)	Weight in MASI (%)
Attijariwafa Bank	Banking	146.30 billion MAD	20%
Managem	Mining	153.5 billion MAD	4.80%
Maroc Telecom (IAM)	Telecommunications	80.7 billion MAD	11.8%
Marsa Maroc (SODEP)	Port services	62.5 billion MAD	6.40%
Banque Centrale Populaire	Banking	53.5 billion MAD	7.60%
Bank of Africa	Banking	42.8 billion MAD	5.30%
TAQA Morocco	Utilities	41.8 billion MAD	4.20%
LafargeHolcim Maroc	Construction materials	41.9 billion MAD	4.50%

Table 1 presents the characteristics of the selected companies, including their economic sector, market capitalization, and respective weight in the MASI Index. This selection criterion is consistent with previous event study literature, which generally focuses on large-cap firms because of their higher liquidity, broader investor coverage, and stronger sensitivity to market-wide announcements.

2.2. Event identification

The event (Table 2) analyzed in this study corresponds to the official announcement of the launch of the Moroccan voluntary carbon market. The announcement was publicly released on September 24, 2024, through an official communication jointly issued by Casablanca Finance City Authority (CFCA) and the Caisse de Dépôts et de Gestion (CDG) during the conference entitled “Scaling up carbon Markets in Africa”.

This announcement represents the first official public disclosure concerning the operational launch of Morocco’s voluntary carbon market. The event date ($t = 0$) was therefore defined as September 24, 2024, corresponding to the first official dissemination of this information to financial market participants.

To minimize potential contamination from earlier information releases, publicly available news

sources and official institutional communications were carefully reviewed prior to defining the event date. No earlier official announcement conveying equivalent information was identified.

2.3. Estimation window and event window

Following the standard event study methodology, the empirical analysis is divided into three distinct periods: the estimation window, the gap period, and the event window.

The estimation window, extending from 30 to 11 trading days before the announcement ($[-30; -11]$), was used to estimate the normal relationship between individual stock returns and market returns while remaining sufficiently close to the announcement date. Although longer estimation windows such as $[-120; -20]$ or $[-250; -30]$ are frequently employed in studies of large and highly liquid stock markets, a shorter estimation window was more appropriate in the present study. The estimation window ends before the event to avoid any contamination from information leakage or anticipatory trading.

A gap period of ten trading days ($[-10; -1]$) was introduced between the estimation window and the event window. The primary objective of this buffer period is to reduce the possibility that information leakage or investors’ anticipatory trading behavior

Table 2. Identification of the event

Event	Description
Event	Announcement of the launch of the Moroccan voluntary carbon market
Event date ($t = 0$)	September 24, 2024
Source	Joint official communication issued by the Caisse de Dépôt et de Gestion (CDG) and Casablanca Finance City Authority (CFCA)
Communication channel	CDG official website, CFCA official website, Medias24, Le Matin

could bias the estimation of normal returns. The purpose is to ensure that the estimation parameters are not influenced by the event itself.

Finally, the event window extends from four trading days before to five trading days after the announcement $[-4; +5]$. This interval allows the analysis to capture both potential information leakage before the official announcement and delayed market reactions afterward.

In addition, a shorter event window $[-3; +3]$ was examined as a robustness test to verify whether the empirical conclusions remain stable under an alternative event-window specification.

2.4. Expected return model

To assess the impact of the announcement of the Moroccan voluntary carbon market on stock prices, expected returns were estimated using the market model, one of the most widely adopted approaches in event study methodology (Brown & Warner, 1985; MacKinlay, 1997).

The market model assumes a stable linear relationship between the return of an individual stock and the return of the overall market. Compared with the mean adjusted return model, the market model accounts for market-wide movements and generally provides more efficient estimates of expected returns by reducing the variance of abnormal returns.

The empirical analysis relies on the daily closing stock prices of the sampled companies and the MASI Index, obtained from the Investing.com financial platform. Adjusted closing prices were used to account for corporate actions such as dividends and stock splits, ensuring that observed price variations reflect actual market reactions. These data were then used to calculate daily logarithmic returns and estimate expected returns under the market model.

The daily stock return for each company was computed using continuously compounded returns as follows:

$$R_{(i,t)} = \ln \left(\frac{P_{(i,t)}}{P_{(i,t-1)}} \right), \quad (1)$$

where $R_{(i,t)}$ is the daily return of company i on day t ; $P_{(i,t)}$ is the closing stock price of company i on day t ; $P_{(i,t-1)}$ is the closing stock price of company i on the previous trading day.

Similarly, the daily market return was calculated using the MASI Index:

$$R_{(m,t)} = \ln \left(\frac{MASI_{(t)}}{MASI_{(t-1)}} \right), \quad (2)$$

where $R_{(m,t)}$ denotes the daily return of the MASI Index; $MASI_{(t)}$ represents the closing value of the MASI Index on day t .

The expected return of each stock was then estimated using the market model:

$$E(R_{i,t}) = \alpha_i + \beta_i R_{m,t}, \quad (3)$$

where $E(R_{i,t})$ is the expected return of company i on day t ; α_i is the intercept representing the stock-specific return independent of market movements; β_i measures the sensitivity of the stock return to changes in the market return; $R_{m,t}$ is the daily return of the MASI Index.

The parameters α_i and β_i were estimated separately for each company using the Ordinary Least Squares (OLS) method in EViews, based on observations from the estimation window $[-30; -11]$.

Abnormal returns (AR) were subsequently obtained as the difference between the observed return and the expected return predicted by the market model:

$$AR_{(i,t)} = R_{(i,t)} - E(R_{m,t}), \quad (4)$$

where $AR_{(i,t)}$ represents the abnormal return of company i on day t . A positive AR indicates that the stock outperformed its expected return, whereas a negative one suggests an underperformance relative to normal market conditions.

To evaluate the overall market response, individual abnormal returns were aggregated across the eight companies to compute the Average Abnormal Return (AAR):

$$AAR_{(i,t)} = \frac{1}{N} \sum AR_{(i,t)}, \quad (5)$$

where $N = 8$ is the number of firms included in the sample.

Finally, cumulative abnormal returns (CAR) were calculated by summing the daily average abnormal returns over the event window:

$$CAR_t = \sum_{t=t1}^{t2} AAR_t, \quad (6)$$

where $t1$ and $t2$ denote the beginning and the end of the event window, respectively. The CAR provides a measure of the overall stock market reaction throughout the event period and constitutes the primary indicator used to assess whether the announcement generated a statistically significant impact on investors' expectations.

2.5. Statistical significance testing and robustness analysis

To evaluate whether the announcement generated statistically significant market reactions, the significance of both the Average Abnormal Returns (AARs) and the Cumulative Abnormal Returns (CARs) was evaluated using Student's t -tests.

The t -statistic for each daily AAR was computed as:

$$t(AAR_t) = \frac{AAR_t}{SE(AAR_t)}, \quad (7)$$

where the standard error is calculated as:

$$SE(AAR_t) = \frac{SD(AR_t)}{\sqrt{N}}, \quad (8)$$

where $SD(AR_t)$ is the cross-sectional standard deviation of abnormal returns on day t , and N is the number of firms in the sample. Statistical significance was assessed using two-tailed p -values at the 5% significance level.

The significance of the cumulative market reaction was assessed using the following statistic:

$$t(CAR_t) = \frac{CAR_t}{SD(AAR_t) \cdot \sqrt{L}}, \quad (9)$$

where $SD(AAR_t)$ represents the standard deviation of the average abnormal returns, and L denotes the number of trading days included in the event window.

Finally, to examine the robustness of the finding, the analysis was repeated using an alternative event window $[-3; +3]$ in addition to the baseline $[-4; +5]$. Comparing results across different windows makes it possible to verify whether the conclusions remain stable and are not sensitive to the choice of the event window.

3. RESULTS

3.1. Market model estimation

Before estimating abnormal returns, the market model was estimated separately for each of the eight sampled firms using daily stock returns over the estimation window $[-30; -11]$.

Table 3 reports the estimated intercepts (α), market coefficients (β), and coefficients of determination (R^2) obtained from the Ordinary Least Squares (OLS) regressions.

Table 3. Market model estimation results

Company	α	β	R^2
Attijariwafa Bank	-0.000666	0.122239	0.002936
Managem	0.001083	1.597618	0.124077
Maroc Telecom (IAM)	0.002634	0.566607	0.027736
Marsa Maroc (SODEP)	0.001676	0.423122	0.036726
Banque Centrale Populaire	-0.000421	0.573622	0.049265
Bank of Africa	-0.001589	0.887516	0.043430
TAQA Morocco	-0.000302	-0.361186	0.004964
LafargeHolcim Maroc	-0.002089	0.783713	0.056085

The estimated beta (β) coefficient reveals substantial differences in the sensitivity of individual stocks to market movements. Most companies exhibit positive beta values, indicating that their stock returns generally move in the same direction as the MASI Index.

Managem records the highest market sensitivity ($\beta = 1.598$), suggesting that its stock price reacts more strongly than the market to changes in overall market conditions. Conversely, TAQA Morocco presents a slightly negative beta ($\beta = -0.361$), indicating a weaker and inverse relationship with market fluctuations during the estimation period.

The estimated intercepts (α) remain relatively small for all firms, suggesting that the stock-specific returns independent of market performance were limited throughout the estimation window. This finding is consistent with the assumptions underlying the market model.

The R^2 values range from 0.003 to 0.124, indicating that market returns explain only a limited proportion of the variation in individual stock returns. Although relatively low, these values are commonly observed in studies based on daily stock returns, particularly in emerging financial markets characterized by lower liquidity and higher firm-specific volatility. Consequently, the estimated parameters remain appropriate for calculating expected returns and abnormal returns in the context of an event study.

Overall, the estimated market model parameters are used to estimate expected returns, which in turn allow the calculation of abnormal returns in the subsequent analysis.

3.2. Daily average abnormal returns

Table 4 represents the daily Average Return (AAR) during the event window [$t=-4$; $t=+5$].

Before the announcement ($t = -4$ to $t = -1$), average abnormal returns (AAR) fluctuated around zero, and none were statistically significant (p -values > 0.05), suggesting no information leakage before the official announcement. Figure 1 illustrates the evolution of average abnormal returns (AAR) throughout the event window, providing a visual representation of the market reaction before, during, and after announcement.

On the event day ($t = 0$), the AAR is -0.238% , but the associated t -statistic (-1.006) and p -value (0.3478) indicate that this reaction is not statistically significant. Similarly, no significant abnormal returns were observed during the post-event period, despite positive AARs on day $t = +1$, $t = +2$, and $t = +4$. Likewise, the negative abnormal return recorded on $t = +5$ (-0.92%) remained statistically

Table 4. Daily Average Returns (AAR) during the event window

Event Day	Date	AAR (%)	CAR (%)	SD(AR)	Standard Error	t-statistic	p-value
$t = -4$	09/18/2024	-0.221%	-0.221%	0.0089721	0.003173	-0.696	0.5089
$t = -3$	09/19/2024	0.585%	0.365%	0.0108077	0.003821	1.532	0.1694
$t = -2$	09/20/2024	-0.042%	0.322%	0.0135242	0.004782	-0.088	0.9323
$t = -1$	09/23/2024	-0.001%	0.321%	0.0064753	0.002289	-0.004	0.9968
$t = 0$	09/24/2024	-0.238%	0.084%	0.006689	0.002365	-1.006	0.3478
$t = +1$	09/25/2024	0.658%	0.742%	0.0197037	0.006966	0.945	0.376
$t = +2$	09/26/2024	0.611%	1.353%	0.0271829	0.009611	0.635	0.5453
$t = +3$	09/27/2024	-0.057%	1.295%	0.017092	0.006043	-0.095	0.9271
$t = +4$	09/30/2024	0.623%	1.919%	0.0295625	0.010452	0.596	0.5697
$t = +5$	10/01/2024	-0.917%	1.002%	0.0140273	0.004959	-1.849	0.1069

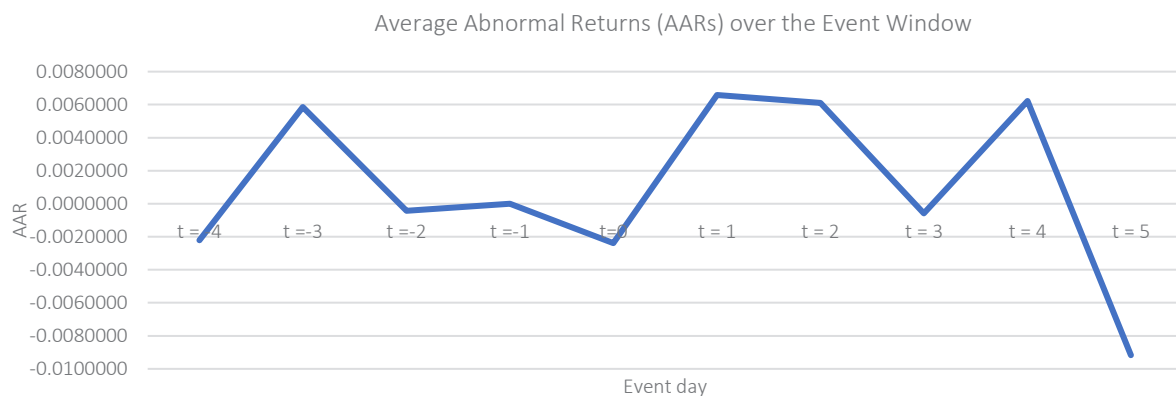


Figure 1. Evolution of average abnormal returns during the event window

insignificant ($p = 0.107$), despite being the largest negative AAR observed during the event window.

Overall, the absence of statistically significant AAR throughout the event window suggests that the announcement of the operational launch of Morocco's voluntary carbon market did not generate a measurable short-term reaction in the stock prices of the sampled firms. This indicates that investors did not perceive the announcement as sufficiently new or value-relevant information to affect the market valuation of the sampled firms during the event window.

3.3. Cumulative abnormal results

Table 5 represents the cumulative abnormal returns (CARs) over the baseline event window $[-4; +5]$.

The CAR reached 1.00%, indicating a modest positive cumulative market reaction following the announcement. However, the associated t -statistic (0.615) and p -value (0.550) show that this cumulative effect is not statistically significant at conventional significance levels.

The absence of statistically significant CARs suggests that the announcement did not generate a persistent abnormal market response over the entire window. Although stock prices exhibited slight cumulative gains following the event, these changes cannot be distinguished from normal market fluctuations.

Consequently, the empirical findings do not provide sufficient evidence to conclude that the announcement of the operational launch of Morocco's voluntary carbon market created significant short-term value for investors. To verify whether this conclusion depends on the choice of the event window, an additional robustness

analysis was conducted using an alternative event window.

3.4. Robustness analysis

To evaluate the robustness of the finding, the event study was repeated using an alternative event window $[-3; +3]$, in addition to the baseline window $[-4; +5]$. The results are reported in Table 6.

The cumulative abnormal return over the alternative event window reached 1.52%, compared to 1.00% for the baseline window. However, neither estimate was statistically significant.

For the $[-3; +3]$ window, the t -statistic was 1.494 with a p -value of 0.186, while the $[-4; +5]$ window produced a t -statistic of 0.615 and a p -value of 0.550.

The consistency of results across both event windows indicates that the findings are robust to changes in event-window specification. Regardless of the window considered, the announcement did not generate statistically significant abnormal returns, suggesting that the absence of a measurable market reaction is not driven by the choice of the event window.

Overall, the empirical results consistently indicate that the announcement of the operational launch of Morocco's voluntary carbon market did not trigger statistically significant short-term abnormal returns among the sampled firms.

4. DISCUSSION

The empirical finding indicates that the official announcement of the operational launch of Morocco's voluntary carbon market did not gen-

Table 5. Cumulative Abnormal Returns (CARs) over the event window

Event Window	CAR	SD(CAR)	t-statistic	p-value	Interpretation
$[-4; +5]$	1.00%	0.0163	0.615	0.550	Not statistically significant

Table 6. Robustness analysis using alternative event windows

Event Window	CAR	SD(CAR)	t-statistic	p-value	Conclusion
$[-4; +5]$	1.00%	0.0163	0.615	0.550	Not significant
$[-3; +3]$	1.52%	0.0101	1.494	0.186	Not significant

erate statistically significant abnormal returns among the sampled firms.

Neither the daily abnormal returns (AARs) nor the cumulative abnormal returns (CARs) were statistically significant over the baseline event window $[-4; +5]$, and these conclusions remained unchanged under the alternative event window $[-3; +3]$. Overall, the results suggest that the announcement did not significantly influence investors' short-term valuation of the largest listed companies on the Casablanca Stock Exchange.

Several factors may explain this limited market reaction. First, the announcement represented the launch of a voluntary carbon market rather than the introduction of a mandatory regulatory framework. Consequently, investors may have perceived the initiative as having limited immediate financial implications for listed companies.

In addition, the voluntary carbon market in Morocco is still in its early stages, with its economic mechanisms, participation rules, and expected financial benefits yet to be fully established. Under such conditions, investors may have adopted a cautious attitude, preferring to wait for the concrete regulatory developments before revising their expectations.

These findings are broadly consistent with those reported by Keele and DeHart (2011), who found that announcements related to firms' participation in voluntary environmental initiatives did not generate significant positive stock market reactions, suggesting that investors may perceive such announcements as having uncertain or limited

short-term financial implications. Conversely, the results differ from those of Ramiah et al. (2013), who documented significant market reactions to major environmental policy announcements in Australia. This discrepancy may be explained by the nature of the event considered in the present study. Unlike mandatory environmental regulations with direct economic consequences, the Moroccan voluntary carbon market was introduced as a voluntary mechanism whose immediate financial effects on listed firms remained uncertain.

The findings may also reflect the informational efficiency of the Moroccan stock market with respect to environmental announcements. The absence of significant abnormal returns before the event suggests that there was no observable information leakage prior to the official announcement. At the same time, the absence of a significant reaction after the announcement indicates that the disclosed information was not perceived as sufficiently new or value-relevant to alter market expectations in the short term.

Finally, these results should not be interpreted as evidence that carbon markets lack economic importance. Rather, they suggest that, at the time of the announcement, the Moroccan voluntary carbon market had not yet reached a level of maturity capable of influencing investors' decisions.

As the carbon market develops and participation expands, future announcements on regulatory implementation, carbon credit transactions, and corporate participation may generate stronger market responses.

CONCLUSION

This study examined the stock market reaction to the official announcement of the operational launch of Morocco's voluntary carbon market by applying the event study methodology to the eight largest companies listed on the Casablanca Stock Exchange.

The empirical findings indicate that the announcement did not generate statistically significant average abnormal returns (AARs) or cumulative abnormal returns (CARs) during the event window. The robustness analysis based on an alternative event window confirmed these results, suggesting that investors did not perceive the announcement as information with immediate financial implications for the sampled firms. Overall, the evidence indicates that the operational launch of Morocco's voluntary carbon market did not trigger a statistically significant short-term reaction in the Moroccan stock market.

This study contributes to the environmental finance literature by providing one of the first empirical assessments of investors' reactions to the announcement of a voluntary carbon market in an emerging economy. These results suggest that the Moroccan voluntary carbon market was still at an early stage of development, limiting its immediate impact on investors' expectations and stock market valuation.

This study is not without limitations. The analysis is based on a relatively small sample of large listed companies and focuses exclusively on short-term market reactions surrounding a single announcement. Future research could extend the analysis by examining long-term market effects, comparing reactions across different sectors or emerging economies, and assessing investors' responses to subsequent developments in Morocco's voluntary carbon market, including the implementation of trading mechanisms and firms' participation in carbon credit transactions.

AUTHOR CONTRIBUTIONS

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