Proceedings of the 4th International Conference on Machine Learning and Automation
DOI: 10.54254/2755-2721/2026.37073

# *Investor Attention Misallocation Induced by Carbon Intensity Disclosure of Crypto Assets*

**Ying Zhou**

*Faculty of Business, Economics and Law (BEL), The University of Queensland, Queensland, Australia*

*zhouying02549@outlook.com*

***Abstract.*** As the crypto-asset market continues to expand, the energy consumption and carbon emissions associated with proof-of-work mechanisms have increasingly entered investors' pricing considerations. Environmental disclosure has therefore become an important source of information for assessing the non-financial risks of digital assets. To examine whether carbon intensity disclosure changes the allocation of investor attention, major crypto assets from 2019 to 2025 are analysed by combining CoinGecko market data, Google Trends search intensity, and publicly available estimates of energy consumption and carbon emissions. Carbon intensity, abnormal search intensity, abnormal trading volume, and realized volatility are constructed, while two-way fixed-effects models and local projections are applied to identify disclosure shocks and their dynamic market consequences. The results indicate that high-carbon assets experience stronger abnormal search attention following disclosure, while the interaction between disclosure events and carbon intensity is significantly positive. A one-standard-deviation attention-misallocation shock increases short-run realized volatility by approximately 0.27 percentage points at its peak, and the abnormal trading response reaches its highest level around the second trading day after disclosure before gradually declining. These patterns indicate that the salience of carbon information first alters investors' information-search structure and subsequently generates short-term trading pressure. More standardized carbon disclosure and the simultaneous presentation of other financial risk indicators may therefore reduce attention distortions associated with highly salient environmental labels and improve pricing efficiency in crypto-asset markets.

***Keywords:*** Crypto assets, Carbon intensity disclosure, Investor attention, Attention misallocation, Market response

## 1. Introduction

With the development of blockchain technology and digital financial markets, crypto assets have become an increasingly important component of global capital markets. However, their energy consumption and carbon emissions have attracted growing concerns, particularly for proof-of-work assets with intensive computational requirements [1]. Environmental sustainability has gradually become an important dimension in evaluating crypto-asset risks, and carbon intensity disclosure

DOI: 10.54254/2755-2721/2026.37073

provides investors with additional information for identifying environmental uncertainty and potential risks [2]. Nevertheless, crypto markets are characterised by high information transparency, rapid information diffusion, and substantial retail participation, which may cause highly salient environmental indicators to attract disproportionate investor attention. Such attention concentration may reduce investors' consideration of liquidity, price volatility, and technological development potential. Previous studies demonstrate that investor attention affects asset prices through search behaviour, trading activity, and market sentiment [3]. However, whether carbon intensity disclosure changes attention allocation and generates attention misallocation in crypto markets remains insufficiently examined. Therefore, analysing search behaviour, trading responses, and price adjustments around carbon disclosure events provides an approach to understanding how environmental information salience influences crypto-asset valuation.

## 2. Literature review

### 2.1. Carbon intensity measurement

The carbon intensity calculation of the crypto-asset primarily includes the analysis of energy consumption, computation load, sources of power supply and emission factors in order to estimate the environmental effect on various crypto-assets. According to the existing literature, proof of work-based cryptocurrencies, like Bitcoin, usually have a greater number of carbon emissions owing to their constant need for computation load and energy consumption [4]. Taking into account the growing interest in sustainable finance, carbon intensity becomes an important metric to assess the environmental risk associated with the comparison of digital assets. Nevertheless, the differences between assumptions about energy composition, system boundaries and emission factors can introduce uncertainties in carbon intensity assessment [5]. This characteristic allows carbon metrics to perform both the risk identification and information simplification roles. As the result of the environmental impact being condensed into one number, the investor might give much attention to carbon information and pay little attention to consensus efficiency, network effects and utility.

### 2.2. Investor attention formation

According to the investor attention theory, the cognitive resources of market players are limited; hence, people cannot process all available information at the same time. As a result, investors tend to pay attention to visible and communicative signals [6]. Search intensity, media coverage, and abnormal trading activity are commonly used to assess the dynamics of investor attention and provide explanations to market reactions to information shocks. Crypto markets work non-stop and depend greatly on online sources of information, such as social networks, databases, and online forums, thus, investors tend to react to highly salient information [7]. Disclosure of carbon intensity information has significant environmental and public significance and is likely to lead to quick changes in the level of investor searches and discussions. Nevertheless, attention does not always imply information efficiency. If investors start paying too much attention to carbon signals and neglect other factors, such as liquidity, risk-return balance, and technological features, attention resources will be misdirected. Hence, differentiation between information efficiency and attention change is vital in terms of environmental disclosure.

DOI: 10.54254/2755-2721/2026.37073

### 2.3. Market effects of environmental disclosure

Environmental disclosure has become an important mechanism for evaluating sustainability performance and financial risks, with its effects transmitted through investor perception, capital allocation, and market valuation mechanisms [8]. In crypto markets, the absence of unified environmental disclosure standards means that investors often rely on third-party platforms, research reports, and media coverage to obtain carbon-related information, resulting in differences in data reliability, comparability, and dissemination intensity. Highly visible environmental information may strengthen investors' perception of carbon risks, while market reactions may exceed changes justified by actual environmental conditions because of information salience effects [9]. When investors adjust positions primarily in response to carbon labels, short-term price volatility and trading changes may reflect attention redistribution rather than fundamental value adjustments. Therefore, examining search behaviour, trading responses, and price movements following carbon intensity disclosure is important for distinguishing whether environmental information contributes to rational risk pricing or generates investor attention misallocation.

## 3. Experimental methods

### 3.1. Sample construction

The sample covers January 2019 to December 2025 and retains major crypto assets with continuous observations on prices, market capitalisation, trading volume, energy consumption, and carbon emissions. Daily closing prices, USD-denominated trading volume, and market capitalisation are obtained from the historical database of CoinGecko and aligned by UTC date. Investor attention is collected from Google Trends using both asset names and ticker symbols to generate daily Search Volume Index observations. Energy consumption and carbon-emission information are compiled from the Cambridge Bitcoin Electricity Consumption Index, public Digiconomist records, and asset-level estimates reported in peer-reviewed studies. A separate disclosure-event log records the first public release dates of carbon reports, energy-consumption reports, and material revisions to environmental estimates. Market observations are matched at the daily level, whereas annual carbon estimates are mapped to the corresponding trading year. Each disclosure event uses a $[-10,+10]$ trading-day event window and a $[-60,-11]$ estimation window. Stablecoins, inactive assets, and observations without reliably matched carbon information are excluded so that environmental information, attention, and market responses remain temporally comparable.

### 3.2. Variable measurement

Variables are constructed across three linked dimensions: carbon-information shocks, attention allocation, and market responses. Carbon intensity is measured as annual carbon-dioxide-equivalent emissions relative to average market capitalisation during the same year and is scaled as emissions per USD one billion of market value. The Disclosure Indicator refers to the first disclosure or substantial update of carbon information during the period under consideration. The measure of investor attention is provided by Google Trends data and is used to calculate the abnormal search volume index with respect to the average value and standard deviation of the last 30 trading days. Attention misallocation is defined as the positive portion of the abnormal search intensity after considering the benchmark attention model including lagged return, realised volatility, Amihud illiquidity, market capitalisation and aggregated search volume in crypto markets. The market

DOI: 10.54254/2755-2721/2026.37073

performance measures comprise the daily log return, seven-day realised volatility, and abnormal trading volume. The normal trading level is computed over the pre-event estimation window. Lagged return, Bitcoin market return, aggregate crypto volatility and asset size are controlled for in order to isolate the excess attention due to carbon disclosure.

### 3.3. Estimation procedure

A two-way fixed-effects specification is first employed to estimate whether carbon intensity disclosure generates incremental investor attention. The model includes an interaction between disclosure status and carbon intensity to distinguish the general information effect from the additional salience associated with high-carbon assets [10]. As shown in Equation (1), the coefficient β3 captures the incremental abnormal search response associated with greater carbon intensity after controlling for asset heterogeneity and common market shocks.

$$ASVI_{i,t}=\alpha_i+\delta_t+\beta_1 Disclosure_{i,t}+\beta_2 CI_{i,t}+\beta_3\left(Disclosure_{i,t}\times CI_{i,t}\right)+\Gamma' X_{i,t}+\varepsilon_{i,t} \tag{1}$$

Here, $ASVI_{i,t}$ denotes abnormal search intensity, $CI_{i,t}$ is carbon intensity, $X_{i,t}$ contains return, liquidity, size, and market-state controls, while $\alpha_i$ and $\delta_t$ represent asset and date fixed effects.

After identifying an abnormal attention response, fixed-effects local projections are used to estimate the dynamic market consequences of attention misallocation. As shown in Equation (2), a separate $\theta_h$ is estimated for each post-disclosure horizon, allowing volatility and abnormal trading activity to be traced from the initial shock through their peak response and subsequent decay [11].

$$Y_{i,t+h}-Y_{i,t-1}=\alpha_i^{(h)}+\delta_t^{(h)}+\theta_h AM_{i,t}+\Phi_h' X_{i,t}+u_{i,t+h} \tag{2}$$

Here, Y represents realised volatility or abnormal trading volume, $AM_{i,t}$ denotes the standardised attention-misallocation shock, h=0,…,10 is the post-disclosure horizon, and $\theta_h$ measures the dynamic response at each horizon.

## 4. Results

### 4.1. Attention responses to disclosure

The event-window estimates indicate a clear cross-sectional gradient in investor attention following carbon-intensity disclosure. As shown in Table 1, the abnormal search index for the high-carbon group increases from 0.08±0.03 before disclosure to 0.21±0.05 after disclosure, corresponding to an average increase of 0.13±0.04. The corresponding increases for the medium-carbon and low-carbon groups are 0.07±0.03 and 0.04±0.02. Abnormal trading volume in the high-carbon group reaches 14.6±3.2%, compared with 9.3±2.6% and 5.1±2.1% in the medium- and low-carbon groups. In the two-way fixed-effects specification, the interaction between disclosure and carbon intensity produces an estimated coefficient of 0.118 with a clustered standard error of 0.034, statistically significant at the 1% level. The larger increase in abnormal search activity relative to trading activity indicates that carbon disclosure initially reallocates information-search attention before the effect is transmitted into observable trading behaviour.

DOI: 10.54254/2755-2721/2026.37073

Table 1. Investor attention and trading responses to carbon-intensity disclosure

| Carbon-intensity group | Pre-disclosure ASVI | Post-disclosure ASVI | Change in ASVI | Abnormal trading volume | Fixed-effects coefficient |
|---|---|---|---|---|---|
| High carbon | 0.08±0.03 | 0.21±0.05 | 0.13±0.04 | 14.6±3.2% | 0.118*** (0.034) |
| Medium carbon | 0.07±0.02 | 0.14±0.04 | 0.07±0.03 | 9.3±2.6% | 0.067** (0.029) |
| Low carbon | 0.06±0.02 | 0.10±0.03 | 0.04±0.02 | 5.1±2.1% | 0.031 (0.024) |

*Note: Cluster-robust standard errors are reported in parentheses. *** and ** indicate significance at the 1% and 5% levels, respectively.*

## 4.2. Market effects of attention misallocation

The local-projection estimates further show that abnormal investor attention is not absorbed immediately on the disclosure date. As shown in Figure 1, a one-standard-deviation attention-misallocation shock increases realised volatility by approximately 0.27 percentage points at its peak on the first trading day after disclosure. The response then declines progressively and approaches zero between days 8 and 10. Abnormal trading activity exhibits a more cumulative pattern, rising rapidly after disclosure and reaching a peak of approximately 14.6% around the second trading day before gradually decaying. The nested 90% and 95% confidence bands indicate that the volatility response is concentrated mainly within the first four post-disclosure trading days, whereas later confidence intervals increasingly include zero. The temporal ordering of abnormal search activity, intensified trading, and elevated volatility is consistent with the identification strategy in Section 3.3: salient carbon information first creates attention exceeding that explained by conventional financial fundamentals, subsequently generates short-term trading pressure, and loses market impact as the salience shock dissipates.

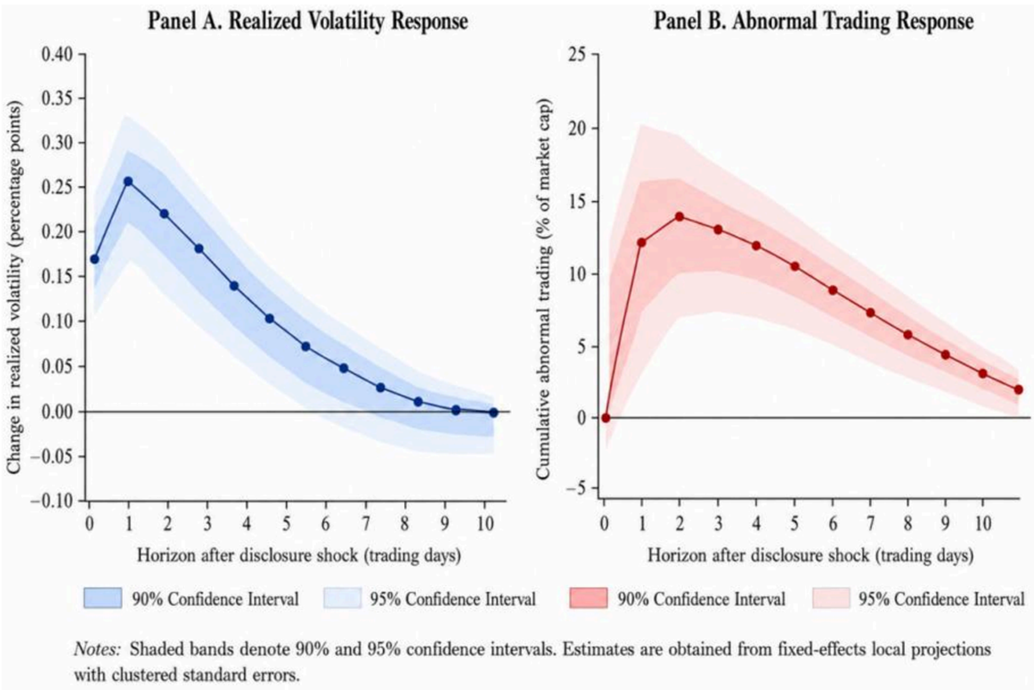


Figure 1. Dynamic market effects of attention misallocation

DOI: 10.54254/2755-2721/2026.37073

## 5. Discussion

The results indicate that the market consequences of carbon intensity disclosure operate primarily through an attention channel rather than through an immediate and persistent revaluation of asset fundamentals. High-carbon assets exhibit stronger abnormal search activity and larger abnormal trading responses after disclosure, suggesting that investors are especially sensitive to environmental information with high visibility and clear evaluative implications. The local-projection estimates further show that realized volatility rises most strongly during the first several trading days and subsequently declines, revealing the short-lived nature of the market response to carbon-related salience. The fact that abnormal search activity reaches an elevated level before trading responses peak is also consistent with a transmission mechanism in which information attention changes before portfolio decisions are executed. When investors allocate disproportionate cognitive resources to carbon intensity labels, simultaneous consideration of liquidity, technological security, and fundamental asset value may weaken. Environmental disclosure can therefore improve the recognition of carbon-related risks while also generating an attention-crowding effect across competing financial information.

## 6. Conclusion

An empirical framework linking carbon intensity disclosure, investor attention misallocation, and market responses is developed using public crypto-market data, online search behaviour, and carbon-emission information. The results show that greater carbon intensity significantly strengthens abnormal investor attention following disclosure. Misallocated attention is further responsible for heightened short-term volatility and abnormal trading behavior, which diminishes gradually as time progresses after the initial few trading days. Environmental information is thus important for determining the value of crypto-assets because the impact of such environmental factors on asset value seems to take place primarily through reallocated attention and trading activity in the short term, as opposed to revaluation through fundamental considerations. These results suggest the necessity of increasing comparability in environmental reporting of crypto-assets. The standardization of boundaries of carbon emissions and the presentation of carbon information along with liquidity, technological risk, and market environment may help avoid any bias induced by an overemphasis on one particular piece of information.

## References

[1] Chamanara, S., Ghaffarizadeh, S. A., & Madani, K. (2023). The environmental footprint of bitcoin mining across the globe: Call for urgent action. *Earth's Future, 11*(10), e2023EF003871.

[2] Papp, A., Almond, D., & Zhang, S. (2023). Bitcoin and carbon dioxide emissions: Evidence from daily production decisions. *Journal of Public Economics, 227*, 105003.

[3] Zribi, W., Boufateh, T., & Guesmi, K. (2023). Climate uncertainty effects on bitcoin ecological footprint through cryptocurrency environmental attention. *Finance Research Letters, 58*, 104584.

[4] Ndubuisi, G., & Urom, C. (2023). Dependence and risk spillovers among clean cryptocurrencies prices and media environmental attention. *Research in International Business and Finance, 65*, 101953.

[5] Koch, S., & Dimpfl, T. (2023). Attention and retail investor herding in cryptocurrency markets. *Finance Research Letters, 51*, 103474.

[6] Hu, Y., Shen, D., & Urquhart, A. (2023). Attention allocation and cryptocurrency return co-movement: Evidence from the stock market. *International Review of Economics & Finance, 88*, 1173–1185.

[7] Meng, Y., Goodell, J. W., & Shen, D. (2023). Information shocks and investor underreaction: Evidence from the Bitcoin market. *Finance Research Letters, 56*, 104109.

DOI: 10.54254/2755-2721/2026.37073

[8] Yousaf, I., et al. (2024). Environmental attention and uncertainties of cryptocurrency market: Examining linkages with crypto-mining stocks. *Finance Research Letters, 59*, 104672.
[9] Będowska-Sójka, B., & Kliber, A. (2024). Do investors in dirty and clean cryptocurrencies care about energy efficiency in the same way?. *Finance Research Letters, 67*, 105852.
[10] Proelss, J., Schweizer, D., & Sevigny, S. (2024). Is bitcoin ESG-compliant? A sober look. *European Financial Management, 30*(2), 680-726.
[11] Sapra, N., et al. (2024). Uncovering Bitcoin's electricity consumption relationships with volatility and price: Environmental repercussions. *Journal of Environmental Management, 356*, 120528.