

# How do Climate Policy Events Shape the Pricing of Carbon in ETS Compliance and Voluntary Carbon Credit Markets?

**Patrick Behr**

Center for Climate Finance and Sustainability (CCFS)

**Riccardo Cosenza**

Center for Climate Finance and Sustainability (CCFS) / Università della Svizzera italiana

**Eric Nowak**

Swiss Finance Institute / Center for Climate Finance and Sustainability (CCFS) / Università della Svizzera italiana

**Papa Orgen**

Fulda University of Applied Sciences / Ulm University / Center for Climate Finance and Sustainability (CCFS)

## In a nutshell

- **Event study** of ground-breaking climate policy events
- Test for pricing relationship, **structural breaks** between carbon markets

## Contribution

- The first study of **climate policy events** impact on **voluntary carbon prices**
- Understanding both carbon markets' **reactions to key policy events** is essential

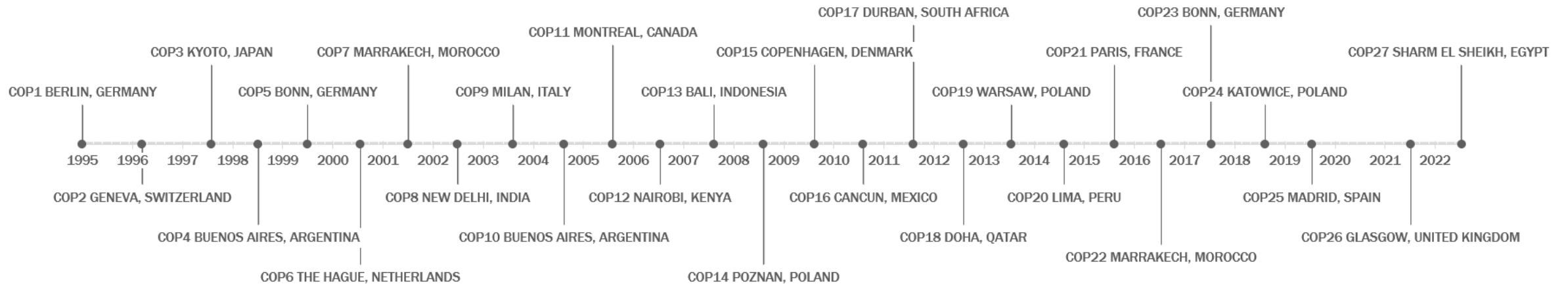
## Results

- Climate policy events **shape carbon prices** in both markets
- Compliance markets seem to **respond more** than voluntary markets

# Why do CoPs matter?

Climate policy events like COPs play a vital role in global efforts to combat climate change

- **Global collaboration:** United Nations Framework Convention on Climate Change (UNFCCC)
- **Policy development:** Limit global warming to below 2°C above pre-industrial levels
- **Scientific awareness:** Intergovernmental Panel on Climate Change (IPCC)



**COP1 (Berlin, 1995):** Adoption of the Berlin Mandate, which established a framework for negotiations on greenhouse gas emissions reductions.

**COP3 (Kyoto, 1997):** Adoption of the Kyoto Protocol, which set binding emission reduction targets, to limit and reduce greenhouse gases for developed countries.

**COP11 (Montreal, 2005):** Adoption of the Montreal Action Plan, which addressed issues related to the Kyoto Protocol's implementation and the future of climate change negotiations.

**COP15 (Copenhagen, 2009):** Negotiations focused on reaching a new global climate agreement to succeed the Kyoto Protocol but resulted in a non-binding political accord, the Copenhagen Accord.

**COP21 (Paris, 2015):** Adoption of the Paris Agreement, a landmark agreement with the goal of limiting global warming to well below 2 degrees Celsius and pursuing efforts to limit it to 1.5.

**COP24 (Katowice, 2018):** Set the operational details for the practical implementation of the Paris Agreement, including guidelines for reporting and transparency.

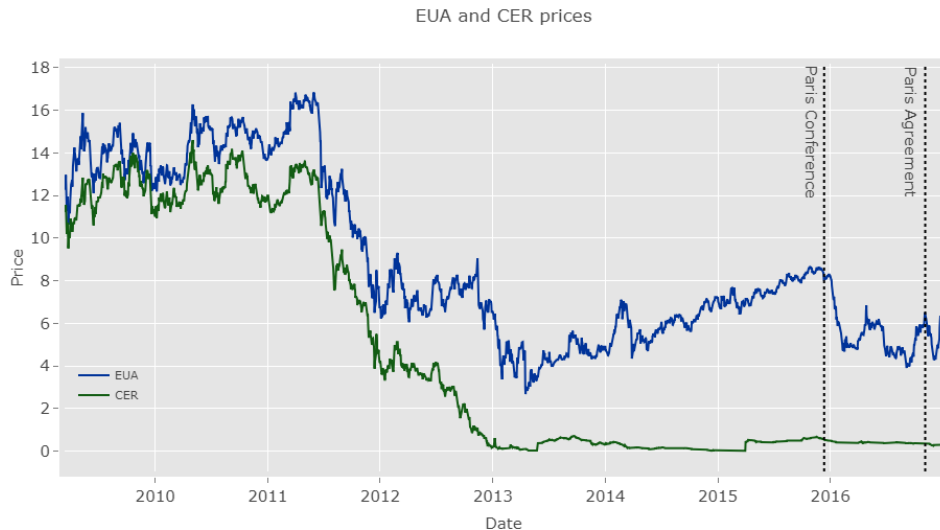
**COP26 (Glasgow, 2021):** Renewed focus on enhancing climate action and commitments to keep global temperature rise well below 2 degrees Celsius. Finalization of the Paris Agreement rulebook.

# What is the impact of climate policy events on carbon prices?

## Compliance carbon market:

- Backed by regulators
- Long-term solution to stop pollution

EUA: European Union Allowances



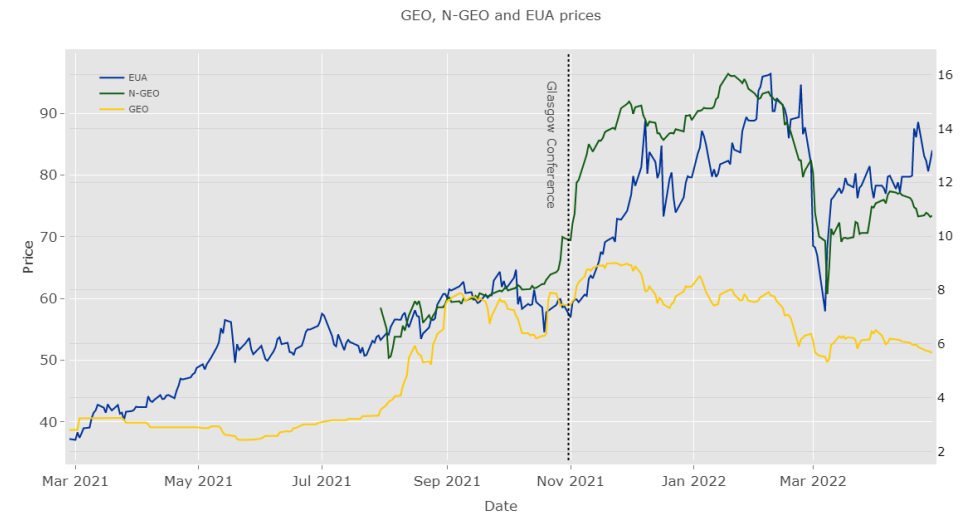
## Voluntary carbon market:

- Non-compulsory participation
- Avoidance, or removal of emissions

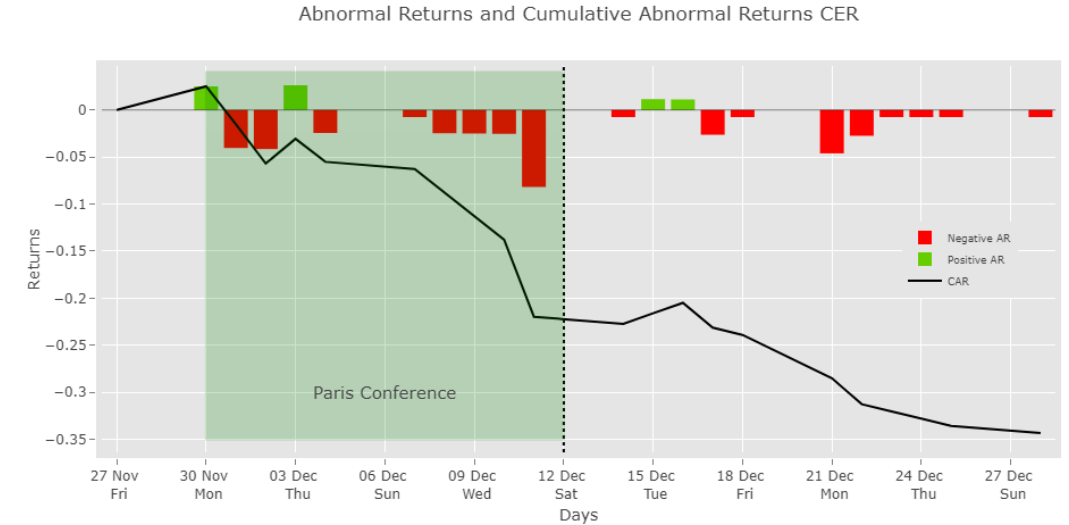
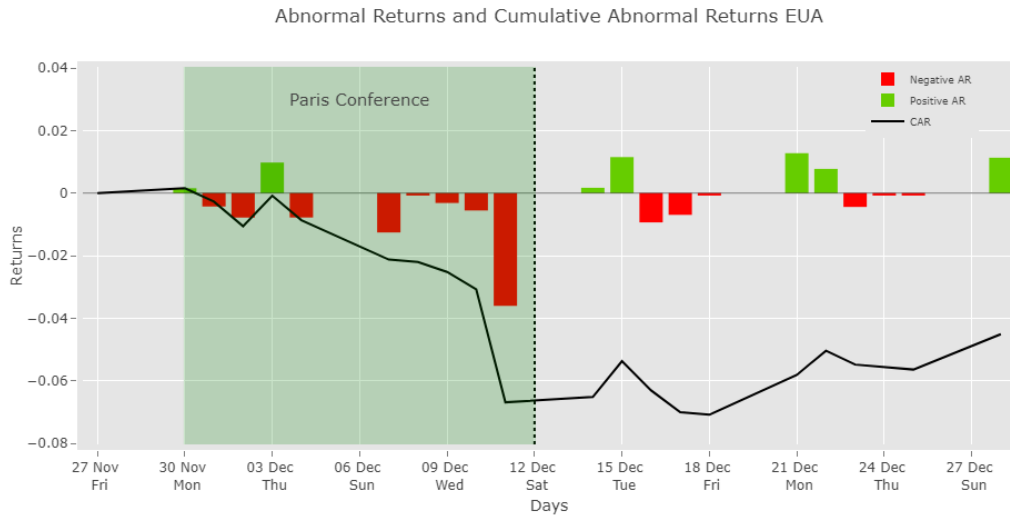
CER: Certified Emission Reductions

GEO: Global Emissions Offset

NGEO: Natural-based Global Emissions Offset



# Paris Conference



## Effects:

- Negative expectations about the conference outcome
- Different magnitude reaction of prices in voluntary carbon markets

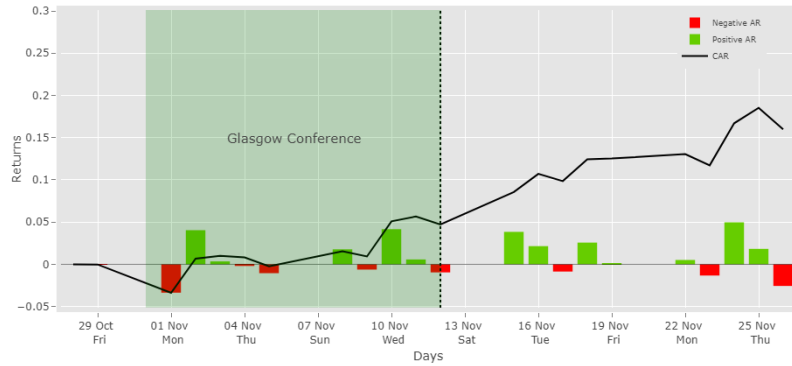
## Possible reasons:

- Non-binding nature of the agreement
- Not explicit aim to phase down or eliminate fossil fuels
- Lack of financial support and concerns about the actual mobilization

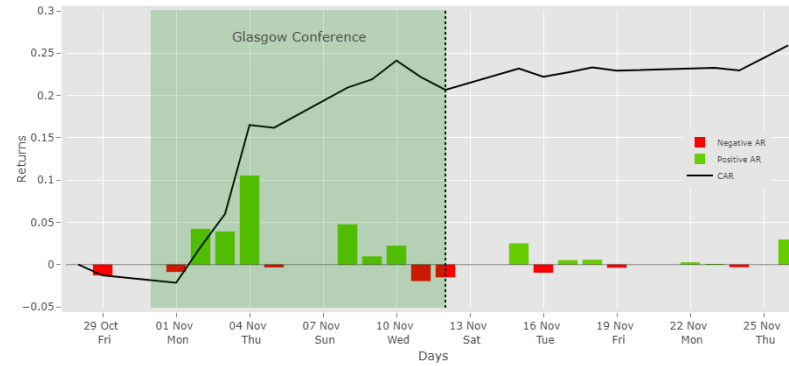
|                                     | Cumulative Abnormal Returns (-11; +11) |            |
|-------------------------------------|--|------------|
| Panel A: Constant Mean Return Model |  |            |
|                                     | (1)<br>EUA                             | (2)<br>CER |
| Pre                                 | -6.69%***                              | -21.98%**  |
| Post                                | 2.01%*                                 | -11.59%*   |
| Panel B: Market Model               |  |            |
|                                     | (1)<br>EUA                             | (2)<br>CER |
| Pre                                 | -4.77%***                              | -17.18%**  |
| Post                                | 0.91%                                  | -14.35%*   |

# Glasgow conference

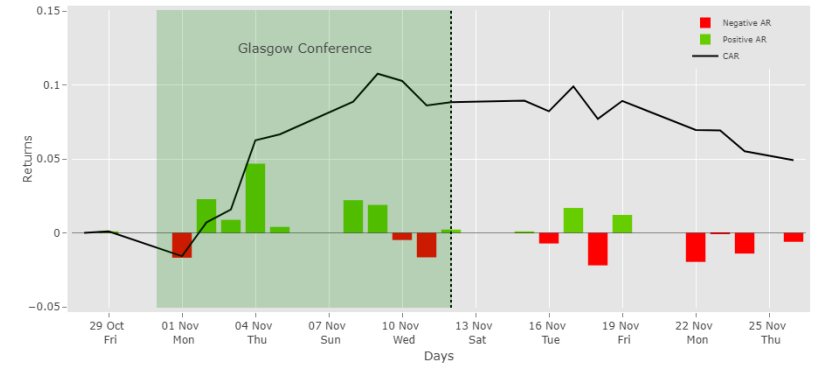
Abnormal Returns and Cumulative Abnormal Returns EUA



Abnormal Returns and Cumulative Abnormal Returns N-GEO



Abnormal Returns and Cumulative Abnormal Returns GEO



## Effects:

- Optimistic expectations during COP26 in both carbon markets
- N-GEO CAR suggests partially fulfilled expectations
- GEO market participants appear to have been disappointed

## Possible reasons:

- Coordinated coal phase-down policy
- New collective quantified goal on adaptation finance by 2025
- Pledge to end illegal deforestation by 2030

## Cumulative Abnormal Return (-11; +11)

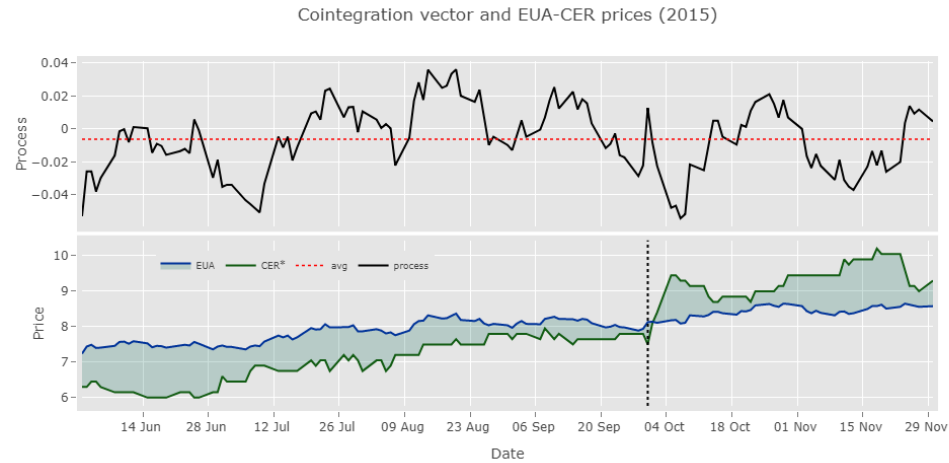
### Panel A: Constant Mean Return Model

|      | (1)<br>EUA | (2)<br>GEO | (3)<br>NGEO |
|------|------------|------------|-------------|
| Pre  | 5.67%***   | 8.62%**    | 22.18%***   |
| Post | 11.25%***  | -3.92%*    | 5.25%**     |

### Panel B: Market Model

|      | (1)<br>EUA | (2)<br>GEO | (3)<br>NGEO |
|------|------------|------------|-------------|
| Pre  | -2.24%***  | 7.68%**    | 20.87%***   |
| Post | 6.21%***   | -4.31%**   | 4.70%**     |

## Pre-Paris Conference

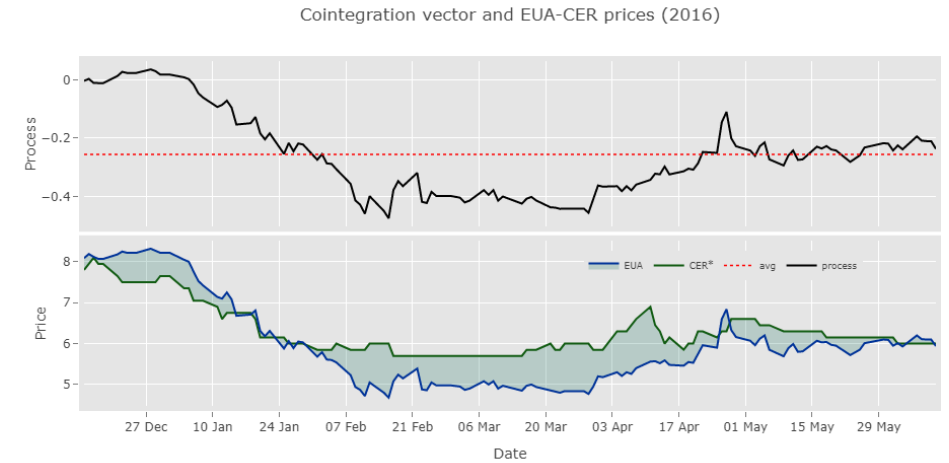


Stationarity of the cointegrating process exists pre-conference but vanishes in the post window

We observe a price inversion (vertical dashed line) approx. 2 months before the conference

Scaled price inversion shows relatively higher price changes in voluntary price

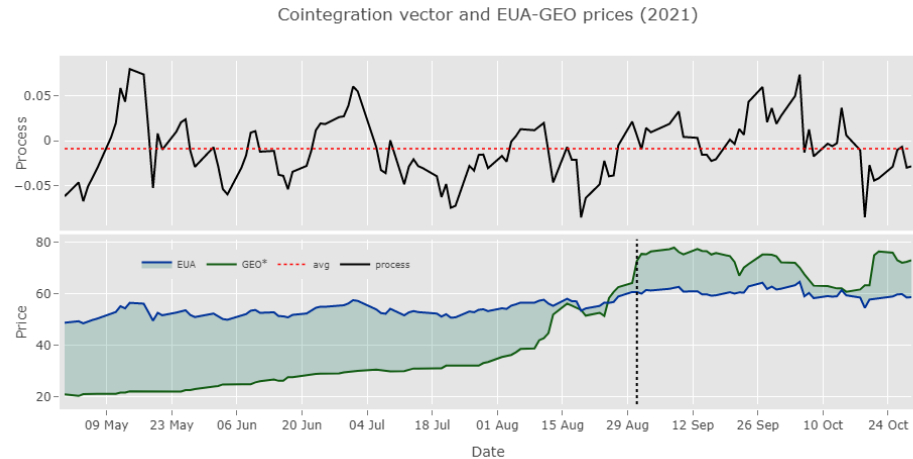
## Post-Paris Conference



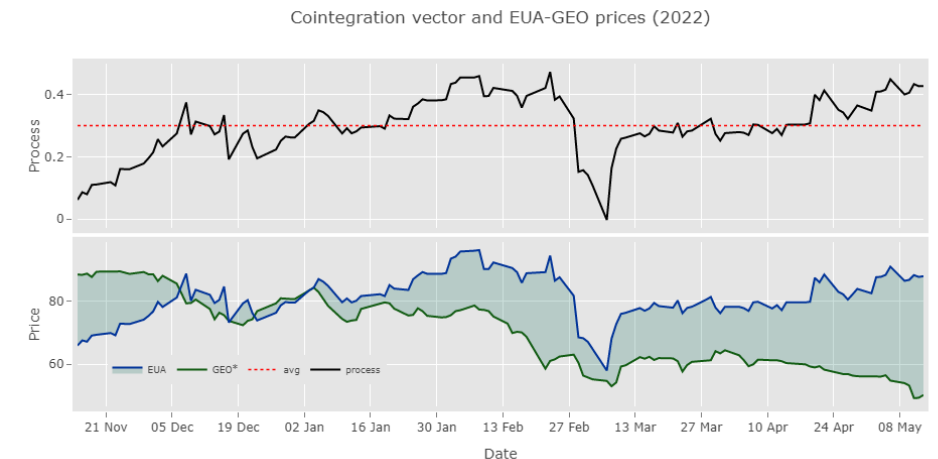
|                        | Johansen<br>Eigenvalues<br>Test |        | Philipps-<br>Perron Test<br>on the<br>co-integration<br>vector | Johansen<br>Trace Test |        | Philipps-<br>Perron Test<br>on the<br>co-integration<br>vector |
|------------------------|---------------------------------|--------|--|------------------------|--------|--|
| Pairs Paris Conference |                                 |        |  |                        |        |  |
|                        | $H_0$                           | Test   | p-value  | $H_0$                  | Test   | p-value  |
| EUA-CER pre            | $r \leq 1$                      | 3.29   | 0.02**   | $r \leq 1$             | 3.29   | 0.02**   |
|                        | $r = 0$                         | 13.32* |  | $r = 0$                | 16.61* |  |
| EUA-CER post           |                                 |        | 0.89   |                        |        | 0.89   |



## Pre-Glasgow Conference



## Post-Glasgow Conference



Stationarity of the cointegrating process exists pre- and post-conference

We observe a price inversion (vertical dashed line) approx. 2 months before the conference

Scaled price inversion shows relatively higher price changes in voluntary price compared to compliance prices

|                          | Johansen<br>Eigenvalues<br>Test |          | Philipps-<br>Perron Test<br>on the<br>co-integration<br>vector | Johansen<br>Trace Test |          | Philipps-<br>Perron Test<br>on the<br>co-integration<br>vector |
|--------------------------|---------------------------------|----------|--|------------------------|----------|--|
| Pairs Glasgow Conference |                                 |          |  |                        |          |  |
| EUA–GEO pre              | $r \leq 1$                      | 6.51     | 0.01***  | $r \leq 1$             | 6.51     | 0.01**   |
|                          | $r = 0$                         | 18.58**  |  | $r = 0$                | 25.09*** |  |
| EUA–GEO post             |                                 |          | 0.09*  |                        |          | 0.09*  |
| EUA–NGEO Pre             | $r \leq 1$                      | 8.30*    | 0.03**   | $r \leq 1$             | 8.30*    | 0.03**   |
|                          | $r = 0$                         | 20.36*** |  | $r = 0$                | 28.66*** |  |
| EUA–NGEO Post            |                                 |          | 0.02**   |                        |          | 0.02**   |

# Conclusion

We show empirically that climate policy events such as Conference of Parties (CoPs) matter significantly for global carbon pricing, offering a sense of policy direction to market participant within the global carbon policy framework

Important climate policy events:

- Shape carbon pricing in compliance markets
- May spur a strong price response also for voluntary carbon markets

Policymakers have a significant role in shaping how the global economy manages the transition to net zero:

- Not building up expectations that lead to disappointment
- Actionable and binding policy outcomes are required

# Thank you!

Questions & Feedback

# Methodology

## Event study

Single firm event study → sample quantile test

- Constant mean return model

$$AR_t = r_t - r_{avg}$$

- Market model

$$AR_t = r_{i,t} - \hat{\alpha}_i - \hat{\beta} r_{m,t}$$

$$GCM I = \frac{1}{2} ICE \text{ Carbon Index} + \frac{1}{2} CER$$

$$GCM I = \frac{1}{2} ICE \text{ Carbon Index} + \frac{1}{2} \left\{ \begin{array}{l} GEO \\ GEO(\frac{volume \text{ GEO}}{total \text{ volume}}) + N GEO(\frac{volume \text{ N GEO}}{1.5 \times total \text{ volume}}) \end{array} \right.$$

## Cointegration

VAR process using Johansen (1988)

$$X_t = \mu + \Pi_1 X_{t-1} + \dots + \Pi_k X_{t-k} + \varepsilon_t$$

Re-write the model using the lag operator  $\Delta$ :

$$\Delta X_t = \nu + \Gamma_1 \Delta X_{t-1} + \dots + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + \varepsilon_t$$

Test the rank of  $\Pi$  using Johansen 1990. Null hypothesis:

$H_0 : \exists r$  co-integration relationships

$H_0 : \exists r + 1$  co-integration relationships

Copenhagen Conference

|                                     | Cumulative Abnormal Return (-11; +11) |            |
|-------------------------------------|---------------------------------------|------------|
| Panel A: Constant Mean Return Model |                                       |            |
|                                     | (1)<br>EUA                            | (2)<br>CER |
| Pre                                 | -2.50%                                | -3.38%*    |
| Post                                | -6.91%**                              | -9.65%***  |

Paris Agreement

|                                     | Cumulative Abnormal Return (-6; +6) |            |
|-------------------------------------|-------------------------------------|------------|
| Panel A: Constant Mean Return Model |                                     |            |
|                                     | (1)<br>EUA                          | (2)<br>CER |
| Pre                                 | 10.81%***                           | 3.86%**    |
| Post                                | -13.48%***                          | -1.89%     |

Sharm El-Sheikh Conference

|                                     | Cumulative Abnormal Return (-11; +11) |            |             |
|-------------------------------------|---------------------------------------|------------|-------------|
| Panel A: Constant Mean Return Model |                                       |            |             |
|                                     | (1)<br>EUA                            | (2)<br>GEO | (3)<br>NGEO |
| Pre                                 | -6.13%*                               | 1.75%      | -5.42%**    |
| Post                                | 14.84%***                             | -4.19%*    | -3.25%*     |