

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

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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

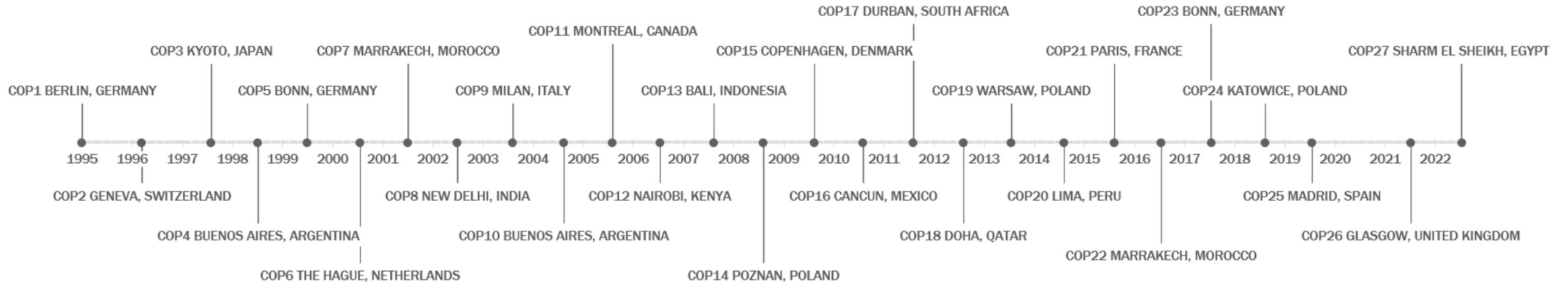
Results

- 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

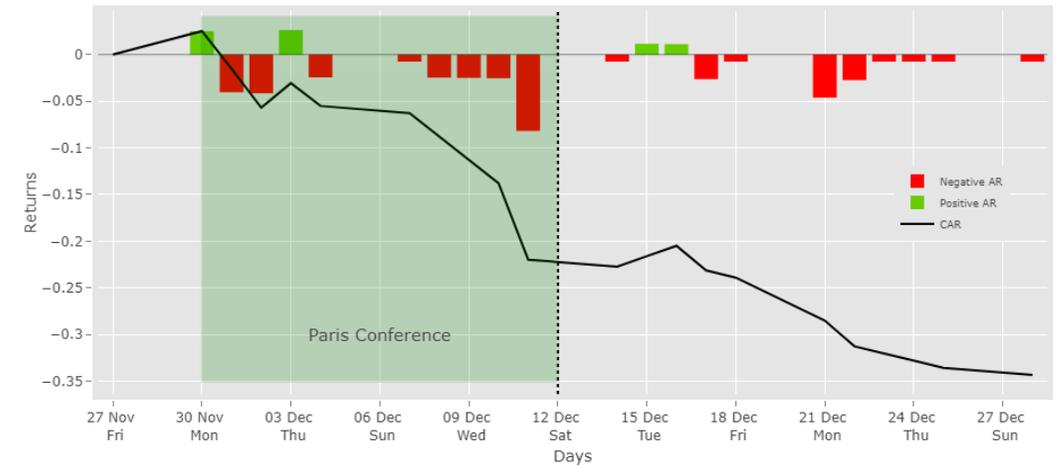


Paris Conference

Abnormal Returns and Cumulative Abnormal Returns EUA



Abnormal Returns and Cumulative Abnormal Returns CER



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)

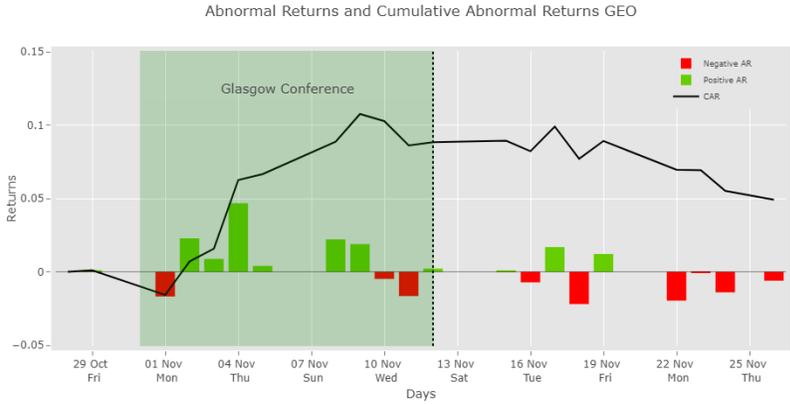
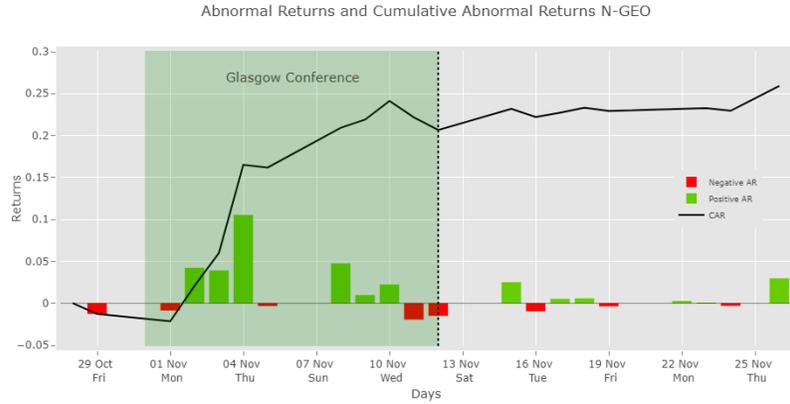
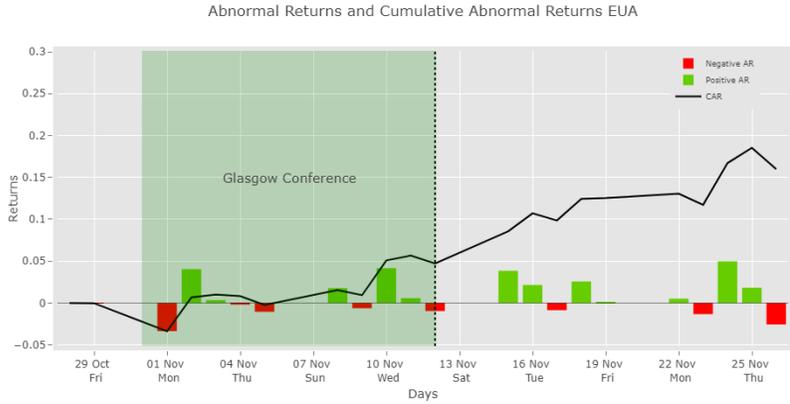
Panel A: Constant Mean Return Model

	(1) EUA	(2) CER
Pre	-6.69%***	-21.98%**
Post	2.01%*	-11.59%*

Panel B: Market Model

	(1) EUA	(2) CER
Pre	-4.77%***	-17.18%**
Post	0.91%	-14.35%*

Glasgow conference



Effects:

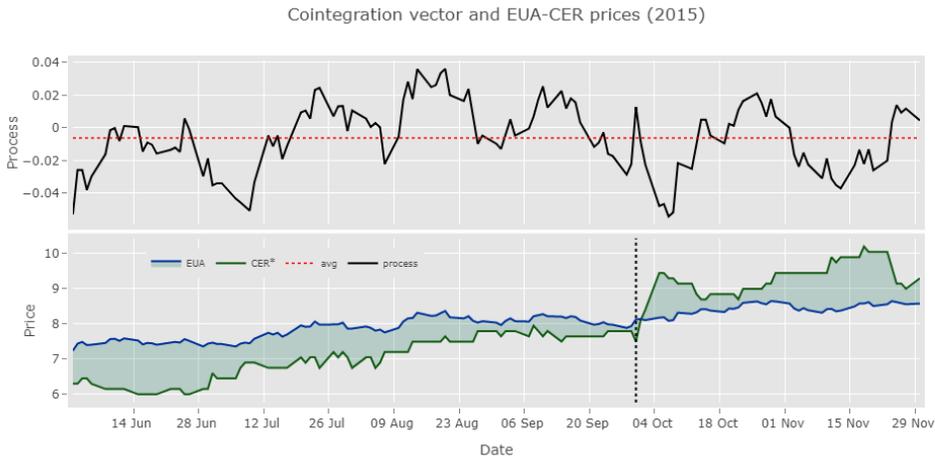
- Optimistic expectations during COP26 in both carbon markets
- N-GEO CAR suggests partially fulfilled expectations
- GEO market participants appear to have been disappointed

Possible reasons:

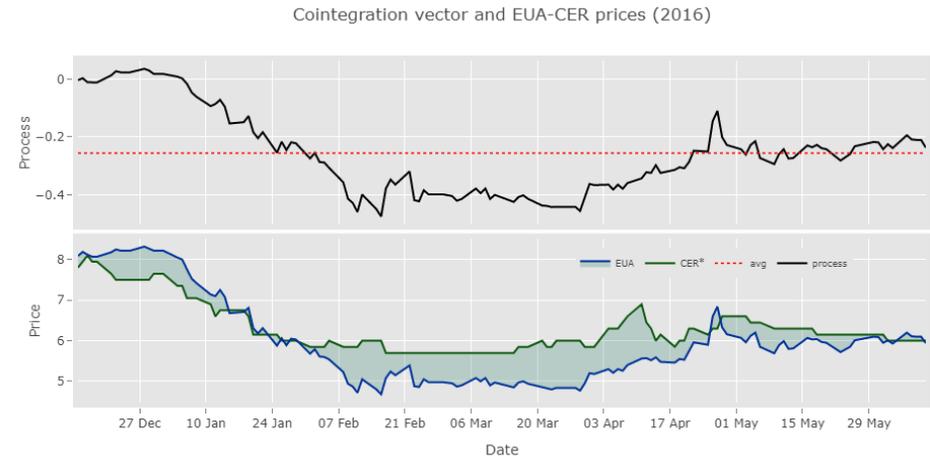
- Coordinated coal phase-down policy
- New collective quantified goal on adaptation finance by 2025
- Pledge to end illegal deforestation by 2030

Cumulative Abnormal Return (-11; +11)			
Panel A: Constant Mean Return Model	(1) EUA	(2) GEO	(3) NGEO
Pre	5.67%***	8.62%**	22.18%***
Post	11.25%***	-3.92%*	5.25%**
Panel B: Market Model	(1) EUA	(2) GEO	(3) NGEO
Pre	-2.24%***	7.68%**	20.87%***
Post	6.21%***	-4.31%**	4.70%**

Pre-Paris Conference



Post-Paris Conference



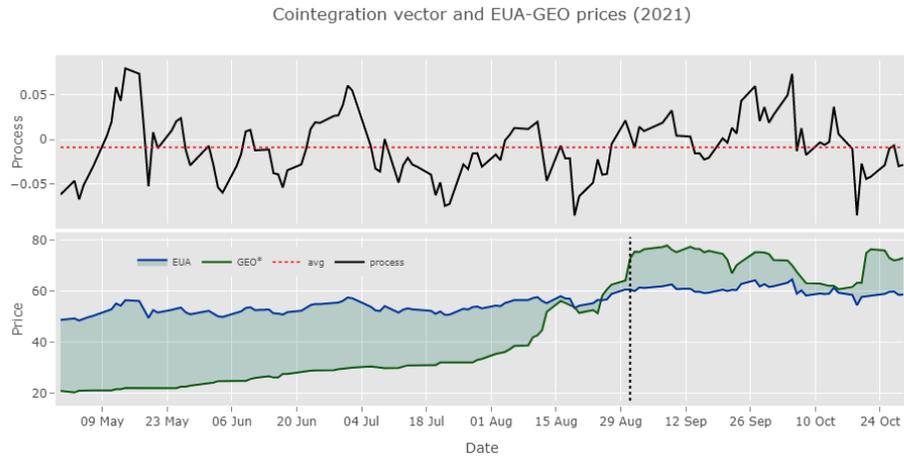
Stationarity of the cointegrating process exists pre-conference but vanishes in the post window

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

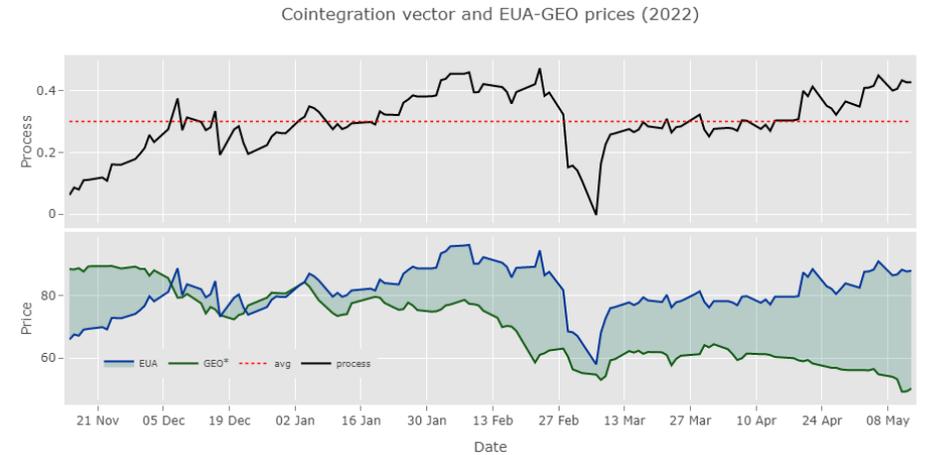
Scaled price inversion shows relatively higher price changes in voluntary price

	Johansen Eigenvalues Test		Philipps-Perron Test on the co-integration vector		Johansen Trace Test		Philipps-Perron Test on the co-integration 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 Eigenvalues Test		Philipps-Perron Test on the co-integration vector	Johansen Trace Test		Philipps-Perron Test on the co-integration 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 Δ :

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

Test the rank of Π 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) EUA	(2) 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) EUA	(2) 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) EUA	(2) GEO	(3) NGEO
Pre	-6.13%*	1.75%	-5.42%**
Post	14.84%***	-4.19%*	-3.25%*