

Climate Change and Central Banks

TALKS AND REALITY

Fatih Kansoy

– University of Oxford –

September 16, 2024

– Bank of England –

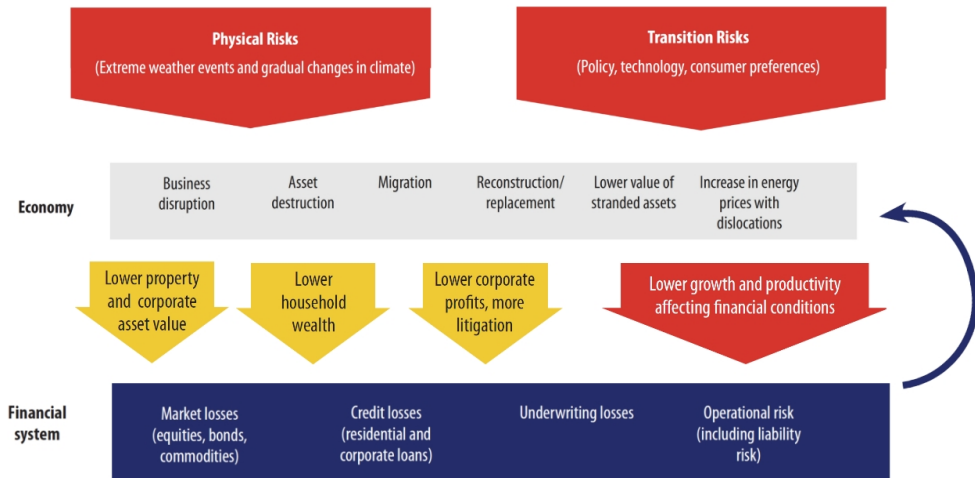
Today: Outline

1. Mechanism
2. Too many jobs
3. Data and Findings
4. Some technical things
5. Some findings

Mechanism

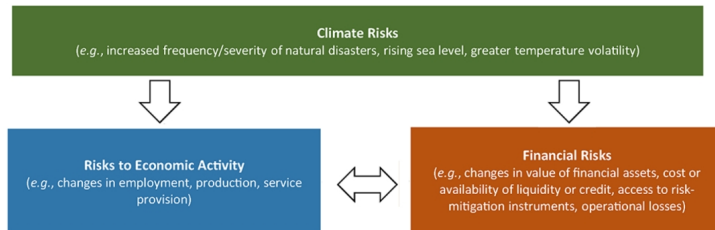
Central Bank and Climate Change

Two channels, but many potential impacts.

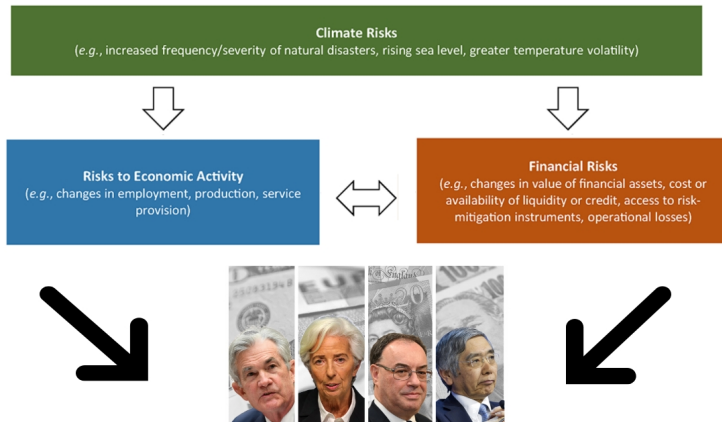


Central Bank and Climate Change

	Climate Risks	Economic Risks	Financial Risks	Financial Stability Risks
Real Estate	Rising sea levels, frequency of storm surges	Increased inundation of coastal parcels	Decreased value of coastal real estate	Abrupt repricing of mortgage lending markets
Insurance	More frequent and severe hurricanes, wildfires, etc.	Greater disruption to local economic activity	Pressure for higher rates, lower supply of insurance and reinsurance	Greater uninsured losses, spillover effects



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Too many jobs

Is it a central banker's job?

Too many jobs to do...

- Economic Growth / Full Employment
- Financial Stability
- Banking Supervision and Regulation
- Dealing with Pandemic
- Micro & Macroprudential Policies
- Inequality
-
-
- and
- Climate crisis



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Free exchange

The perils of asking central banks to do too much

Dealing with inequality and climate change is best left to politicians

Data and Findings

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What we've done:

- ▶ We collect a over 20 thousand central bankers speeches from over 100 countries in between 1997 and 2024.
- ▶ We classified all text by date, country, paragraph and sentences.
- ▶ We first used ClimateBert transformer-based language model to identify if the speech is a climate change related or not.
- ▶ Then we built an original dictionary of climate-related key expressions to identify and explore a over 800 hundred thousand paragraph and a couple of million sentences within the central bankers' speeches.

What we've found:

- ▶ Climate-Related Sentences: Avg: 0.36 sentences, Max: 86 sentences. 75% of speeches have no climate-related content.
- ▶ There are 1452 (out of 20 thousand) speeches that have at least one climate-related sentence.

Some technical things

CLIMATEBERT: A Pretrained Language Model for Climate-Related Text

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Abstract

Over the recent years, large pretrained language models (LM) have revolutionized the field of natural language processing (NLP). However, while pretraining on general language has been shown to work very well for common language, it has been observed that niche language poses problems. In particular, climate-related texts include specific language that common LMs can not represent accurately. We argue that this shortcoming of today's LMs limits the applicability of modern NLP to the broad field of text processing of climate-related texts. As a remedy, we propose CLIMATEBERT, a transformer-based language model that is further pretrained on over 2 million paragraphs of climate-related texts, crawled from various sources such as common news, research articles, and climate reporting of companies. We find that CLIMATEBERT leads to a 48% improvement on a masked language model objective which, in turn, leads to lowering error rates by 3.57% to 35.71% for various climate-related downstream tasks like text classification, sentiment analysis, and fact-checking.

deep learning in NLP allows for impressive results, outperforming traditional methods by large margins (Varini et al. 2020).

These deep learning-based approaches make use of language models (LMs), which are trained on large amounts of textual and unlabelled data. This training on unlabelled data is called *pretraining* and leads to the model learning representations of words and patterns of common language. One of the most prominent language models is called BERT (Bidirectional Encoder Representations from Transformers) (Devlin et al. 2018) with its successors ROBERTA (Liu et al. 2019), Transformer-XL (Dai et al. 2019) and ELECTRA (Clark et al. 2020). These models have been trained on huge amounts of text which was crawled from an unprecedented amount of online resources.

After the pretraining phase, most LMs are trained on additional tasks, the *downstream task*. For the downstream tasks, the LM builds on and benefits from the word representations and language patterns learned in the pretraining phase. The

ClimateBert: this is climate related

Example:

*While part of the reaction to these problems must be institutional strengthening of the financial system, there remains a question whether the broad thrust of macro policy – and, by implication, the spanking rates of growth which these countries have achieved over the past couple of decades – is **sustainable**. To put this more specifically, is it possible to achieve the sorts of integration with international markets, the large inflows of capital which went with this and the rapid transformation of economies, without leaving these economies **vulnerable** to the sorts of changes of sentiment that we have seen in recent months? The constraint on growth is not the conventional one of **resources** and technology. The constraining factor here is just how **resilient** can the financial sector be made: the more robust it can be made, the faster these countries will be able to travel*

Result:

► Score: 0.9942901134490967

ClimateBert: this is not climate related

Example:

- ▶ *One of the potential costs of additional purchases is that they could disrupt functioning in Treasury and MBS markets - a cost that the Desk carefully assesses when it implements the FOMC's policy directive. As you know, there is a finite supply of Treasury and agency securities available to purchase, in terms of both total amount and amounts available in the market at any given time. If the Federal Reserve were to become too dominant a buyer or holder, it could reduce the tradable supply of these securities and discourage trading among market participants, leading to diminished liquidity and price discovery. A significant deterioration in liquidity could lead investors to demand a premium for transacting in these markets, ultimately raising borrowing costs and undermining the program's policy goal. However, as discussed later, the purchases have gone smoothly so far, and market liquidity seems to be holding up well*

Result:

- ▶ Score: 0.994830310344696

Dictionary

Uncontroversial lower case words:

- ▶ *greenhouse gas, global warming, climate change, climate crisis, climate overshoot, carbon footprint, climate justice, nature-based solution, indigenous knowledge, climate security, climate finance, net zero, decarbonization, renewable energy, carbon sink, carbon removal, carbon capture, carbon market, regenerative agriculture, reforestation, afforestation, rewilding, circular economy, blue economy, green job, greenwashing, just transition, paris agreement, nationally determined contribution, united nations framework convention on climate change, intergovernmental panel on climate change*

Uncontroversial upper case words:

- ▶ *UNFCCC, COP, NDCs, NAPs, REDD+, IPCC*

Controversial words:

- ▶ *tipping point, mitigation, adaptation, resilience, loss and damage, weather, climate, feedback loop, long-term strategies, transparent reporting, national adaptation plan, conference of the parties*

Uncontroversial Examples

Paragraph example:

*I congratulate the various organisers for putting together the conference, which I understand is the first of its kind to be held in Hong Kong. If so, it is long overdue. Environmental issues have come very much to the forefront of public awareness in Hong Kong in recent years, and cleaning up the environment has become one of the Government's main preoccupations. There are all sorts of good reasons for wishing to do this, in terms of improving the quality of life and the long-term health and well-being of the people of Hong Kong. But there is also a growing recognition on the part of business, both here and elsewhere, that economic growth is inextricably linked with a healthy environment. At this year's World Economic Forum in Davos, business leaders voted **global climate change** the most pressing issue facing the world's business community. It is all the more disappointing therefore that last week's UN summit conference in The Hague on climate change should have ended in failure*

Sentence example:

*It is all the more disappointing therefore that last week's UN summit conference in The Hague on **climate change** should have ended in failure*

Controversial Examples

Paragraph example:

*While it is easy enough now to see the fracture lines and lack of **resilience** of these financial sectors, it was less easy to predict the outcomes beforehand. The transition from a regulated financial system to a deregulated financial system is intrinsically difficult. Under the best of circumstances, it was inevitably going to be accompanied by false starts and mis-cues*

Sentence example:

*While it is easy enough now to see the fracture lines and lack of **resilience** of these financial sectors, it was less easy to predict the outcomes beforehand.*

Controversial Examples

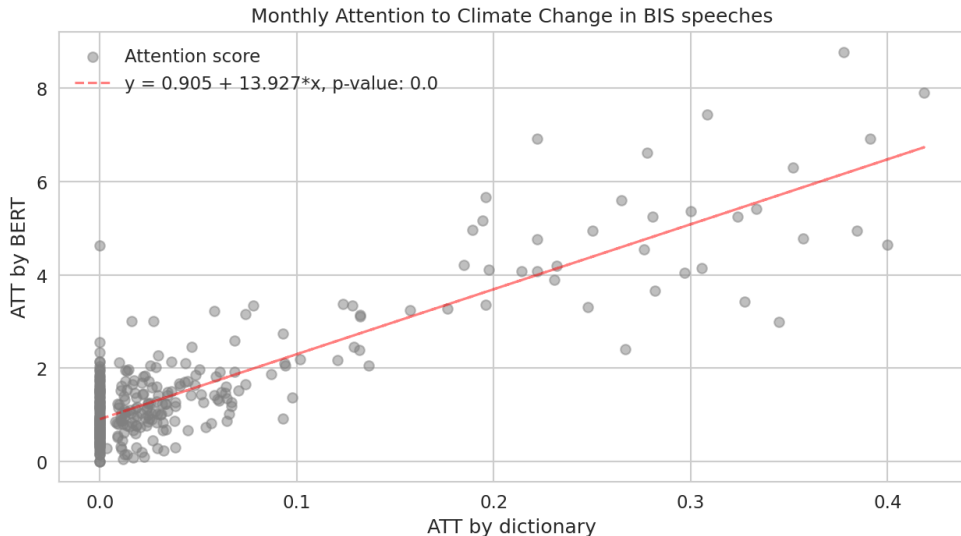
Paragraph example:

*But taking full advantage of that improved potential for economic growth has required a **climate** of confidence in monetary policy. Bringing inflation down in a credible manner has helped to create that **climate**. And because of this, the U.S. monetary authorities have been in a position to encourage the economy to test its full capacity to produce, to create jobs, and to support rising incomes. This would not have been possible in an **environment** of high inflation and high inflation expectations. In such an environment, businesses, workers, and investors respond swiftly to any signs of demand pressures by pushing up prices, wages, and interest rates. And this has the effect of undermining the **sustainability** of the economic... expansion*

Sentence example:

*But taking full advantage of that improved potential for economic growth has required a **climate** of confidence in monetary policy.*

Central Bank and Climate Change



Some findings

CLIMATEBERT: A Pretrained Language Model for Climate-Related Text

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Abstract

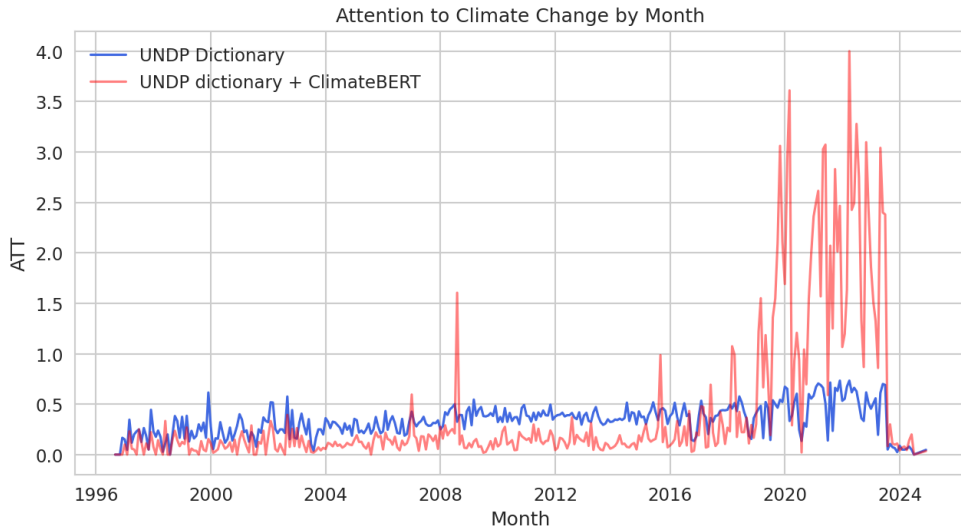
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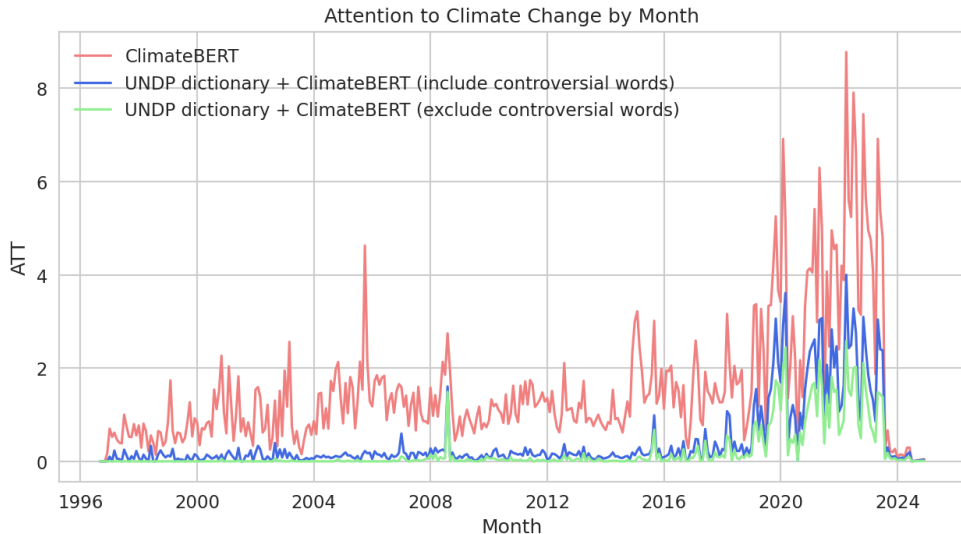
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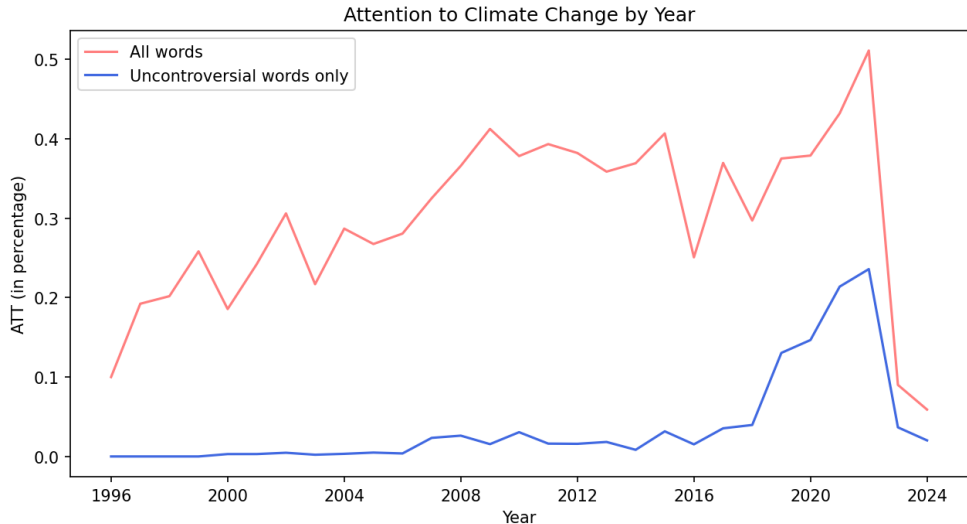
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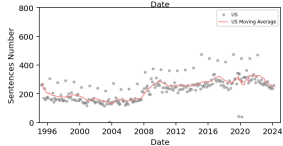
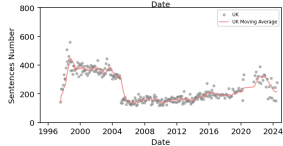
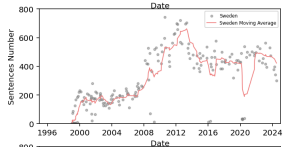
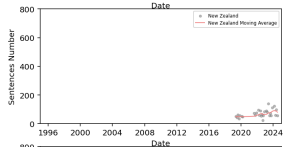
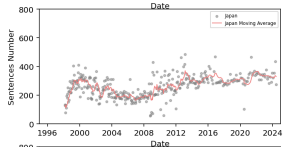
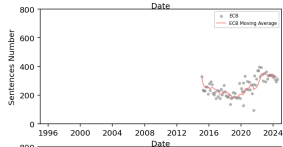
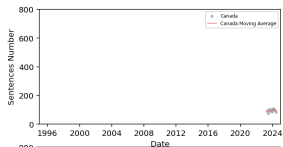
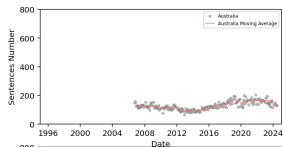
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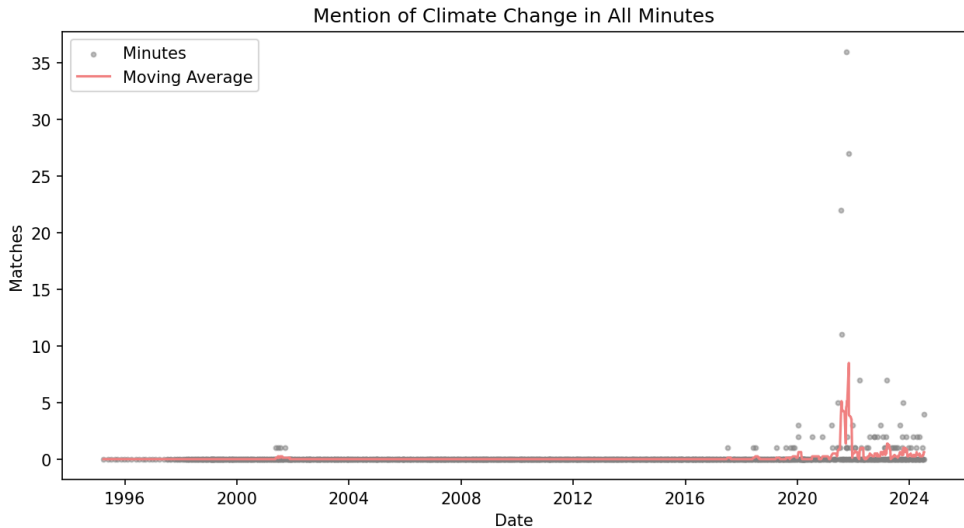
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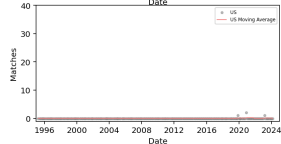
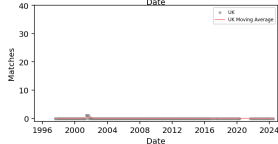
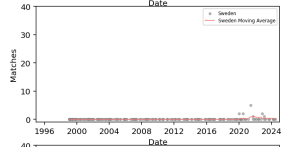
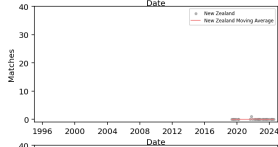
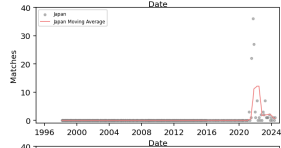
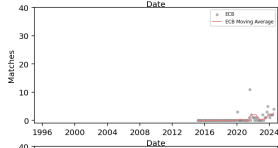
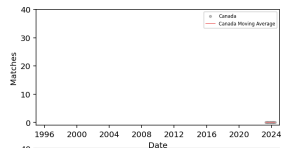
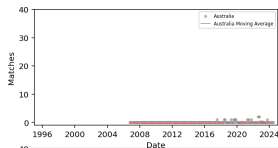
Country Level



Talk and reality: minutes of policy meeting

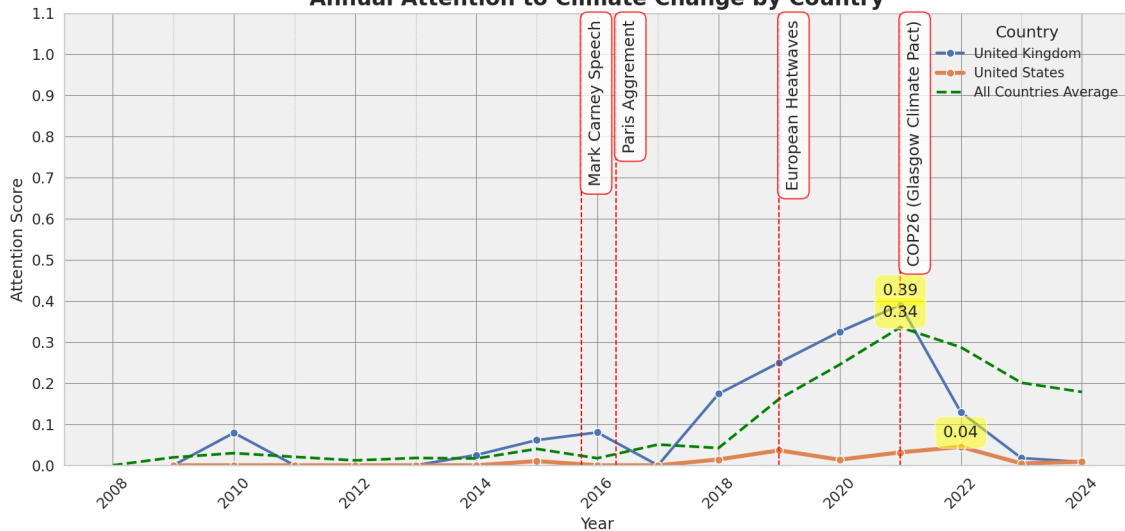


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Annual Attention to Climate Change by Country



Central Bank: The Owner of Carrot-and-Stick

- ▶ Brown-Penalizing vs Green-Supporting
- ▶ Offering loans at a below-market rate to support 'environment businesses' (B. of Japan)
- ▶ Credit quota: Bank loans should be directed to environmental friendly sectors (Bangladesh)
- ▶ Using Environmental, Social, and Corporate Governance (ESG) criteria for the government's pension fund and excludes coal-based energy companies (The Norge Bank)
- ▶ Green Quantitative Easing (ECB)