Discussion

The Great Carbon Arbitrage

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The views expressed herein are solely those of the author and do not necessarily reflect the views of Latvijas Banka or the Eurosystem.

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Summary

Research Question

What are the net financial and environmental gains to society from phasing out coal over the period 2024–2100?

- The net gain is 77.89 trillion US-$ or 1.2% of current world GDP every year
- As coal-phasing out scenario, the NGFS Net Zero 2050 scenario is utilized
- Careful accounting of the financial benefits (avoidance of carbon costs) and costs (financing costs, investment costs) of phasing out coal
- Coal is phased out by switching to renewable energy sources (offshore wind, onshore wind, solar photovoltaic); one sensitivity analysis considers additionally using natural gas as substitute technology for coal

Assessment

It is a great paper, well written and easy to follow! Convincing arguments why one should act as quickly as possible in reducing the reliance on coal as an energy source. Additionally, it forms a sound basis for policy discussion and implementation.

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Comment I

Considering decommissioning costs might be important?

There might be a potentially non-trivial amount of costs missing in Table 4. Decommissioning costs for coal power plants might be not too small, given the size of the market (about one third of electricity generation globally is from coal).

- Using some very ad-hoc calculations and assumptions, collecting some data from reports and studies, considering these costs could be somewhat important ...

	Decommissioning costs $/MW	Total electricity production GW	Total costs Trillion $
Nuclear	750,000	302.65	2.27
Coal	117,000	1145.56	1.34
Offshore wind	136,000	40.00	0.05
Solar photovoltaic	57,000	93.66	0.05
Onshore wind	51,000	181.61	0.09
Gas	15,000	718.69	0.11

Source: Author's calculations and Google search.

Comment II

Nuclear power as another alternative for phasing out coal?

In light of the decision by the EU to grant nuclear power (and natural gas as a transition technology) the status of a 'green' energy source, what if nuclear energy was added as another alternative to substitute for coal usage?

- Nuclear power is a very different animal, as compared to energy from fossil fuels or from renewable resources
  - It generates no carbon emissions much like renewable energy
  - However, it generates nuclear waste that needs to be reprocessed and disposed off at additional potentially substantial costs (according to Nuclear Energy Agency, 1993, the costs for spent fuel disposal are 0.43–1.77M$/TWh and for reprocessing waste disposal 0.25–1.65M$/TWh in July 1991 dollars) which translate to 6,000–30,000$/MW
  - There is the possibility of MCAs and super MCAs
  - As already seen, decommissioning costs of nuclear plants are quite high
- This analysis would require a quite different set of assumptions and data than for coal or renewable resources, but maybe it could be done in your framework?

Comment III

What about the delay of phasing out coal by some key players?

What if in calculating the benefits of avoiding coal emissions, a fraction of companies (e.g., key players, a representative 10%, 20%, ... of the sample) delays by a fixed period of time?

- In the following equation could you play with the set of companies $\mathcal{C}$ or the starting index $\tau = t + 2$ (potentially for only a subset of the firms)?

$$B_{t,T}^{s_1,s_2,\theta} = \theta \times \sum_{i \in \mathcal{C}} \sum_{\tau=t+2}^{T} \Delta E_{i,\tau}^{s_1,s_2}$$

- The motivation for doing such a robustness check is the potentially considerable risk that some countries or some firms delay or do not do enough

Comment IV

What about adding a decreasing loan financing rate for 'green' projects in deriving the financial costs of phasing out coal?

Adding such a possibility could give a sense of the effect if financing costs for green loans become cheaper over time or during the time of the largest investments in coal, due to – for example – bank regulation or fiscal policies that provide benefits to banks or the financial market to grant loans for 'green' projects or issue 'green' bonds.

- This could be achieved by introducing a negative additional factor in the discount rates for renewable energy producers for some time in Equation (8)
- Thus, there would be different discount rates for coal producers $\rho^c = \rho$ and renewable energy producers ρ_t^r in place such as

$$\rho_t^r = \lambda_i \rho^f (1 - \chi_i) + (1 - \lambda_i)(\rho^f + \beta_i \mathrm{E}[R^M] - \epsilon_{\tau \to \tau+26})$$

- E.g., $\epsilon_{\tau \to \tau+26} < 0$ from 2024 to 2050
- It might have a different effect than increasing the discount rate for coal producers

A Couple of Questions

How to account for regulation uncertainty for median unit coal profits?

Energy markets have been regulated heavily and there might be a comeback of more state regulation that might influence the median unit profit of coal in the future more than in the past. That could reduce your estimated benefits of the phase-out of coal. Maybe there could be a way to account for it?

The risk-free rate and risk premium are derived using which data period?

There is not that much variation in the real risk-free rate, there is more in the nominal interest rate, but the average rates could depend on the exact data sample used.

Minor and Very Minor Comments

1. Section 6 on policies to achieve the gains from phasing out coal might be better placed in a separate note in my opinion
   - It is very long (7.5 pages) in an already quite lengthy paper
   - It seems well suited as a policy or practitioners' note but not so much as a part of a research paper
   - If geared towards a general audience, as opposed to an audience composed of finance professionals, it might benefit from additional backup material related to the general mechanics of ABS markets
2. There are some very few typos that I found
   - Page 6, Table 1: 6,80
   - Page 23, below Equation (14): it should read $\sum_{\tau_b=t+2}^{t-1} G_{\mathbf{y},\tau_b}^{s_1,s_2,s_r,q}$ I think
   - Beginning of Section 3.3: "turn to the estimation of the estimation"

Thank You for Your Attention!

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Bibliography

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