BUBBLE OR BABBLE?

Models of stranded fossil fuel assets cannot be trusted

John Constable and Gordon Hughes

The Global Warming Policy Foundation

GWPF Note 14

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About the authors

Dr John Constable is the energy editor of the Global Warming Policy Foundation and a member of its Academic Advisory Council. Professor Gordon Hughes is an energy economist.

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The ongoing campaign to intimidate investors in the fossil fuel industry has found a convenient focus in a new article[1] published in the prominent, though perhaps not entirely serious, pages of *Nature Climate Change*. The press release from the University of Cambridge,[2] with which several of the authors are affiliated, is still more strongly worded and forms the basis of the tone and much of the content of the media coverage:[3]

> Macroeconomic simulations show rates of technological change in energy efficiency and renewable power are likely to cause a sudden drop in demand for fossil fuels, potentially sparking a global financial crisis. Experts call for a 'carefully managed' shift to low-carbon investments and policies to deflate this 'carbon bubble'.

Discrepancies between press statements and their accompanying academic articles are tiresomely familiar, but in this case reference to the paper itself reveals a statement that is only slightly more nuanced. This paper is essentially an op-ed piece in academic garb. It is not a research paper, since it produces no new empirical information, and simply reports the output of a black box modelling exercise using data that is poorly documented and without any evidence of forecasting reliability. Whether the graphs and other outputs tell us anything useful about the future depends very much on whether the reader accepts the reliance that the authors place on

- their selection of input data
- the formulation and calibration of their model.

The predictions made are on the largest scale imaginable and entirely misrepresent the degree of forecast uncertainty. The authors predict that the trajectory arising from current climate policies alone is sufficient to strand many fossil fuel assets, and that if new policies are introduced 'the magnitude of the loss from Stranded Fossil Fuel Assets (SFFA) may amount to a discounted global wealth loss of US$1–4 trillion'. The press release claims that this effect will result in fossil fuel assets 'abruptly shifting from high to low value sometime before 2035'. The authors add that there would be clear winners, the EU and China, and major losers, including Russia, the US, and Canada. The paper recommends that those most threatened by the green revolution have no option but to steer into the skid: 'an exposed country can mitigate the impact of stranding, by divesting from fossil fuels as an insurance policy against what the rest of the world does.'

Predictions of this type should be treated with extreme caution. If an interested party were to reveal the outputs of a complex but practically opaque model predicting a catastrophic decline in the value of, say, sugar factories or chemical plants, by 2035, and then urge a particular course of action likely to fulfil the prophecy, only a fool would swallow it whole. Unfortunately many journalists, and even the editors of *Nature Climate Change*, seem to have swallowed the bait hook, line and sinker. The correct reaction would be to remind oneself:

- that the calibrated model has no demonstrable forecasting record,
- that models are prone to construction bias arising from wishful thinking, that 2035 is a very long way off for this sort of prediction

- that interested parties, in this case climate activist academics, would say this sort of thing, wouldn't they?

Without parsing every line of the main paper, a few illustrative points may be produced to show that prudence of this kind is not misplaced here.

Firstly, consider the opening sentences of the article:

> Several major economies rely heavily on fossil fuel production and exports, yet current low-carbon technology diffusion, energy efficiency and climate policy may be substantially reducing global demand for fossil fuels. This trend is inconsistent with observed investment in new fossil fuel ventures, which could become stranded as a result.

The conceit required to write such sentences is quite out of the ordinary. Did it not occur to the authors that the hundreds of thousands of well-informed investors, who are putting real capital at risk, might individually and certainly in aggregate actually have a clearer picture of the real prospects of fossil fuels? Given that investment tendency, the opening proposition is itself thrown into doubt. Perhaps low carbon technology, energy efficiency, and climate policy are not and will not reduce demand for fossil fuels.

However, it seems that this sort of humble reflection is unlikely to have occurred to these authors, who elsewhere interpret a scenario as representing 'the expectations of investors who do not fully realize the state of change of technology, in particular electric vehicles and renewables, that, as we argue in the text, is taking place' (p. 6). Investors are short-sighted, and just don't understand what is going on, whereas a handful of smart chaps in Cambridge and a few other universities really do. If academics were really this good at seeing in the future of the world's economies it is a wonder that they are not, individually or collectively, very rich.

Secondly, a core component in the exercise reported by authors is that their Technology Diffusion Trajectory 'captures technology phenomena by relying on historical data and projecting these data into the future'. On this basis the authors feel confident that their 'results are robust and driven by historical data rather than by exogenous modelling assumptions.' The peer reviewers of this paper should have picked up this up, and suggested that the authors were mistaken in simple-mindedly extrapolating from current levels of adoption and diffusion, which are heavily dependent on market coercions and income support subsidies. Even if the diffusion were the result of spontaneous technological progress, which it isn't, simple extrapolation would be a mistake. Substantial gains may occur early in the development trajectory, but are very unlikely to persist into technological maturity.

It is obvious that this paper has had vastly more attention than it deserves. It certainly tells us a good deal about what the authors want to be true, but it adds almost nothing to our understanding of how the global energy market is likely to develop. For many it will confirm long-held suspicions that peer review in 'scientific' academic journals is almost useless when dealing with papers that purport to forecast the medium or long term future. Competent reviewers would have suggested that the authors rewrite their paper, not as a projection of some probable future, but as an exercise in comparing and understanding the sensitivity of model forecasts to different assumptions. There is a rich – and not entirely glorious – history of energy models that do everything from projecting future demand to analysing climate policies, including several which originated from groups at the University of Cambridge. Few of them are ever subjected to rigorous ex-post scrutiny. On the other hand, economic modellers are regularly castigated for their inability to produce reliable forecasts about outcomes only one or two years ahead, let alone two or more decades ahead.

If energy and climate modellers wish to be taken as contributing useful forecasts looking forward for one, two or more decades they must first validate their models using the standard tests applied to other forecasting models. First, this involves showing that a model can produce better predictions than simple extrapolation or time-series analysis. It was the recognition that most large-scale economic models cannot do this that forced a reappraisal of the approach to economic forecasting. Note that this is not a matter of model calibration – i.e. can the model parameters be adjusted to fit past data? – but involves model verification when forecasts for 2020 or 2025 based only on data up to, say, 2015 are tested against actual outcomes in the years concerned.

The second test, particularly important in this case, is whether the model produces better forecasts than markets or 'wisdom of crowds' approaches. The authors claim, in effect, that they have a better understanding of the impact of policy and technological development than those who are making investment decisions. That is a very large and inherently implausible claim. The reward for academic modellers is to gain notoriety by standing out from the crowd, and there is no serious penalty for being wrong – a highly skewed set of incentives. On the other hand, market investors may incur substantial collective losses if they get things wrong. This does not guarantee that implied market forecasts are right, but the lack of any penalty for erroneous academic forecasts means that much greater evidence of forecasting success is required before they can be taken seriously.

Overall, this paper appears to be yet another exercise in producing speculative numbers that fit a particular set of preconceptions without any willingness to make a meaningful commitment to the predictions. Journalists, such as those who gave so many column inches to this paper, should be very careful in reporting modelling exercises from even from prestigious academic sources, particularly when they are at complete variance with the behaviour of market participants who are both informed and strongly motivated to reflect accurately on the probable future of that market. Alternatively, one might conclude that both academics and journalists are simply engaged in the entertainment business, and that this is a 'disaster' paper, big at the box office for a fleeting moment and utterly forgotten the next.

Notes

1. Mercure JF, Pollitt H, Viñuales JE, *et al.*, Macroeconomic impact of stranded fossil fuel assets, *Nature Climate Change* (2018). doi:10.1038/s41558-018-0182-1 See: https://www.nature.com/articles/s41558-018-0182-1.
2. http://www.cam.ac.uk/research/news/carbon-bubble-coming-that-could-wipe-trillions-from-the-global-economy-study
3. See for example (a) Harvey F, 'Carbon bubble' could spark global financial crisis, study warns, *The Guardian*, 4 June 2018 https://www.theguardian.com/environment/2018/jun/04/carbon-bubble-could-spark-global-financial-crisis-study-warns (b) Webster B, Green energy predicted to wipe trillions from global economy, *The Times*, 5 June 2018. https://www.thetimes.co.uk/article/green-energy-predicted-to-wipe-trillions-from-global-economy-0br2qrbc6.

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The Global Warming Policy Foundation is an all-party and non-party think tank and a registered educational charity which, while openminded on the contested science of global warming, is deeply concerned about the costs and other implications of many of the policies currently being advocated.

Our main focus is to analyse global warming policies and their economic and other implications. Our aim is to provide the most robust and reliable economic analysis and advice. Above all we seek to inform the media, politicians and the public, in a newsworthy way, on the subject in general and on the misinformation to which they are all too frequently being subjected at the present time.

The key to the success of the GWPF is the trust and credibility that we have earned in the eyes of a growing number of policy makers, journalists and the interested public. The GWPF is funded overwhelmingly by voluntary donations from a number of private individuals and charitable trusts. In order to make clear its complete independence, it does not accept gifts from either energy companies or anyone with a significant interest in an energy company.

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