

Published: 04 April 2016

‘Climate value at risk’ of global financial assets

[Simon Dietz](#) ^{1,2}, [Alex Bowen](#)¹, [Charlie Dixon](#)² & [Philip Gradwell](#)²


Nature Climate Change **6**, 676–679 (2016)

12k Accesses | **206** Citations | **668** Altmetric | [Metrics](#)

Subjects

[Environmental economics](#)

• [Governance](#)

 This article has been [updated](#)

Abstract

Investors and financial regulators are increasingly aware of climate-change risks. So far, most of the attention has fallen on whether controls on carbon emissions will strand the assets of fossil-fuel companies^{1,2}. However, it is no less important to ask, what might be the impact of climate change itself on asset values? Here we show how a leading integrated assessment model can be used to estimate the impact of twenty-first-century climate change on the present market value of global financial assets. We find that the expected ‘climate value at risk’ (climate VaR) of global financial assets today is 1.8% along a business-as-usual emissions path. Taking a representative estimate of global financial assets, this amounts to US\$2.5 trillion. However, much of the risk is in the tail. For example, the 99th percentile climate VaR is 16.9%, or US\$24.2 trillion. These estimates would constitute a substantial write-down in the fundamental

Your Privacy

We use cookies to make sure that our website works properly, as well as some ‘optional’ cookies to personalise content and advertising, provide social media features and analyse how people use our site. By accepting some or all optional cookies you give consent to the processing of your personal data, including transfer to third parties, some in countries outside of the European Economic Area that do not offer the same data protection standards as the country where you live. You can decide which optional cookies to accept by clicking on ‘Manage Settings’, where you can also find more information about how your personal data is processed. Further information can be found in our [privacy policy](#).

**Accept all
cookies**

[Manage preferences](#)

Relevant articles

Open Access articles citing this article.

[Green preferences](#)

Francesco Busato, Bruno Chiarini ... Maria Ferrara

Environment, Development and Sustainability | [Open Access](#) | 09 March 2022

[Stranded Assets: How Policy Uncertainty affects Capital, Growth, and the Environment](#)

Lucas Bretschger & Susanne Soretz

Environmental and Resource Economics | [Open Access](#) | 16 December 2021

[Identifying key processes and sectors in the interaction between climate and socio-economic systems: a review toward integrating Earth-human systems](#)

Kaoru Tachiiri, Xuanming Su & Ken'ichi Matsumoto

Progress in Earth and Planetary Science | [Open Access](#) | 08 April 2021

Access options

Rent or buy this article

Get just this article for as long as you need it.

Subscribe to this journal

Receive 12 print issues and online access

200 00 €

Your Privacy

We use cookies to make sure that our website works properly, as well as some 'optional' cookies to personalise content and advertising, provide social media features and analyse how people use our site. By accepting some or all optional cookies you give consent to the processing of your personal data, including transfer to third parties, some in countries outside of the European Economic Area that do not offer the same data protection standards as the country where you live. You can decide which optional cookies to accept by clicking on 'Manage Settings', where you can also find more information about how your personal data is processed. Further information can be found in our [privacy policy](#).

Accept all cookies

[Manage preferences](#)

- [Log in](#)
- [Learn about institutional subscriptions](#)
- [Read our FAQs](#)
- [Contact customer support](#)

Change history

13 April 2016 In the version of this Letter originally published, a reference was mistakenly omitted. The new reference 15 – *The Cost of Inaction: Recognising the Value at Risk from Climate Change* (Economist Intelligence Unit, 2015) – is now cited in the sixth paragraph and subsequent references have been renumbered in all versions of the Letter.

References

- 1 McGlade, C. & Ekins, P. The geographical distribution of fossil fuels unused when limiting global warming to 2 °C. *Nature* **517**, 187–190 (2015).
- 2 Carbon Tracker & Grantham Research Institute on Climate Change and the Environment *Unburnable Carbon 2013: Wasted Capital and Stranded Assets* (Carbon Tracker, 2013).
- 3 Arent, D.J. et al. in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects* (eds Field, C. B. et al.) (Cambridge Univ. Press, 2014).
- 4 Stern, N. *The Economics of Climate Change: The Stern Review* (Cambridge Univ. Press, 2007).

Your Privacy

We use cookies to make sure that our website works properly, as well as some 'optional' cookies to personalise content and advertising, provide social media features and analyse how people use our site. By accepting some or all optional cookies you give consent to the processing of your personal data, including transfer to third parties, some in countries outside of the European Economic Area that do not offer the same data protection standards as the country where you live. You can decide which optional cookies to accept by clicking on 'Manage Settings', where you can also find more information about how your personal data is processed. Further information can be found in our [privacy policy](#).

**Accept all
cookies**

[Manage preferences](#)

Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (Cambridge Univ. Press, 2012).

- 8 Stern, N. The structure of economic modeling of the potential impacts of climate change: grafting gross underestimation of risk onto already narrow science models. *J. Econ. Lit.* **51**, 838–859 (2013).

- 9 Graff Zivin, J. & Neidell, M. Temperature and the allocation of time: implications for climate change. *J. Labor Econ.* **32**, 1–26 (2014).

- 10 *Climate Change Scenarios: Implications for Strategic Asset Allocation* (Mercer, 2011).

- 11 *Open letter to Finance Ministers in the Group of Seven (G-7)* (Institutional Investors Group on Climate Change, 2015).

- 12 Carney, M. *Breaking the Tragedy of the Horizon: Climate Change and Financial Stability* (Bank of England, 2015).

- 13 *Integrating Risks into the Financial System: The 1-in-100 Initiative Action Statement* (United Nations, 2014).

- 14 Campbell, J. Y. & Viceira, L. M. *Strategic Asset Allocation: Portfolio Choice for Long-Term Investors* (Oxford Univ. Press, 2014).

Your Privacy

We use cookies to make sure that our website works properly, as well as some 'optional' cookies to personalise content and advertising, provide social media features and analyse how people use our site. By accepting some or all optional cookies you give consent to the processing of your personal data, including transfer to third parties, some in countries outside of the European Economic Area that do not offer the same data protection standards as the country where you live. You can decide which optional cookies to accept by clicking on 'Manage Settings', where you can also find more information about how your personal data is processed. Further information can be found in our [privacy policy](#).

**Accept all
cookies**

[Manage preferences](#)

- 18 Gollin, D. Getting Income Shares Right. *J. Polit. Econ.* **110**, 458–474 (2002).
-
- 19 Modigliani, F. & Miller, M. The cost of capital, corporation finance and the theory of investment. *Am. Econ. Rev.* **48**, 261–297 (1958).
-
- 20 Modigliani, F. & Miller, M. Corporate income taxes and the cost of capital: a correction. *Am. Econ. Rev.* **53**, 433–443 (1963).
-
- 21 Arrow, K. J. et al. How should benefits and costs be discounted in an intergenerational context? *Rev. Environ. Econ. Policy* **8**, 145–163 (2014).
-
- 22 Nordhaus, W. D. *A Question of Balance: Weighing the Options on Global Warming Policies* (Yale Univ. Press, 2008).
-
- 23 Dietz, S. & Stern, N. Endogenous growth, convexity of damages and climate risk: how Nordhaus' framework supports deep cuts in carbon emissions. *Econ. J.* **125**, 574–602 (2015).
-
- 24 Moyer, E., Woolley, M., Glotter, M. & Weisbach, D. A. Climate impacts on economic growth as drivers of uncertainty in the social cost of carbon. *J. Legal Stud.* **43**, 401–425 (2014).
-
- 25 Anderson, B., Borgonovo, E., Galeotti, M. & Roson, R. Uncertainty in climate change modeling: can global sensitivity analysis be of help? *Risk Anal.* **34**, 271–293 (2014).
-

Your Privacy

We use cookies to make sure that our website works properly, as well as some 'optional' cookies to personalise content and advertising, provide social media features and analyse how people use our site. By accepting some or all optional cookies you give consent to the processing of your personal data, including transfer to third parties, some in countries outside of the European Economic Area that do not offer the same data protection standards as the country where you live. You can decide which optional cookies to accept by clicking on 'Manage Settings', where you can also find more information about how your personal data is processed. Further information can be found in our [privacy policy](#).

**Accept all
cookies**

[Manage preferences](#)

- 29 Shiller, R. J. Do stock prices move too much to be justified by subsequent changes in dividends? *Am. Econ. Rev.* **71**, 421–436 (1981).
-
- 30 CISL *Unhedgeable Risk: How Climate Change Sentiment Impacts Investment* (Cambridge Institute for Sustainability Leadership, 2015).
-
- 31 Dimson, E., Marsh, P. & Staunton, M. *Equity Premiums Around the World* (CFA Institute, 2011).
-
- 32 Maddison, A. *The World Economy: A Millennial Perspective* (Development Centre of the OECD, 2006).
-
- 33 *Global Financial Stability Report 2011* (IMF, 2011).
-
- 34 Nordhaus, W. D. *RICE-2010 and DICE-2010 Models* (2012);
<http://www.econ.yale.edu/~nordhaus/homepage/RICEmodels.htm>
-
- 35 Nordhaus, W. D. & Boyer, J. *Warming the World: Economic Models of Global Warming* (MIT, 2000).
-
- 36 Dietz, S., Gollier, C. & Kessler, L. *The Climate Beta* (Centre for Climate Change Economics and Policy Working Paper 215 and Grantham Research Institute on Climate Change and the Environment, 2015).
-
- 37 IPCC *Climate Change 2014: Working Group I Contribution to the Fifth Assessment Report* (IPCC, 2014).

Your Privacy

We use cookies to make sure that our website works properly, as well as some 'optional' cookies to personalise content and advertising, provide social media features and analyse how people use our site. By accepting some or all optional cookies you give consent to the processing of your personal data, including transfer to third parties, some in countries outside of the European Economic Area that do not offer the same data protection standards as the country where you live. You can decide which optional cookies to accept by clicking on 'Manage Settings', where you can also find more information about how your personal data is processed. Further information can be found in our [privacy policy](#).

**Accept all
cookies**

[Manage preferences](#)

Author information

Authors and Affiliations

London School of Economics and Political Science, ESRC Centre for Climate Change Economics and Policy and Grantham Research Institute on Climate Change and the Environment, Houghton Street, London WC2A 2AE, UK

Simon Dietz & Alex Bowen

Vivid Economics Ltd, Evergreen House North, 160 Euston Road, Grafton Place, London NW1 2DX, UK

Simon Dietz, Charlie Dixon & Philip Gradwell

Contributions

S.D. led the project, from research design through modelling to writing the manuscript. A.B. helped design the research and draft the manuscript. P.G. helped design the research and run the model. C.D. also helped run the model.

Corresponding author

Correspondence to [Simon Dietz](#).

Ethics declarations

Competing interests

No competing financial interests have affected the conduct or results of this research. However, for the sake of transparency, the authors would like to make clear that they were employed by Vivid Economics Ltd during the production of this research. Vivid Economics Ltd is a London-based economics consultancy. Neither the authors nor the company stands to profit directly from this research.

Supplementary information

Your Privacy

We use cookies to make sure that our website works properly, as well as some 'optional' cookies to personalise content and advertising, provide social media features and analyse how people use our site. By accepting some or all optional cookies you give consent to the processing of your personal data, including transfer to third parties, some in countries outside of the European Economic Area that do not offer the same data protection standards as the country where you live. You can decide which optional cookies to accept by clicking on 'Manage Settings', where you can also find more information about how your personal data is processed. Further information can be found in our [privacy policy](#).

**Accept all
cookies**

[Manage preferences](#)

Cite this article

Dietz, S., Bowen, A., Dixon, C. *et al.* 'Climate value at risk' of global financial assets. *Nature Clim Change* **6**, 676–679 (2016). <https://doi.org/10.1038/nclimate2972>

Received

27 October 2015

Accepted

26 February 2016

Published

04 April 2016

Issue Date

July 2016

DOI

<https://doi.org/10.1038/nclimate2972>

This article is cited by

[Near-term transition and longer-term physical climate risks of greenhouse gas emissions pathways](#)

Ajay Gambhir, Mel George ... Seth Monteith

Nature Climate Change (2022)

[Green preferences](#)

Francesco Busato, Bruno Chiarini ... Maria Ferrara

Environment, Development and Sustainability (2022)

[The impact of carbon tax on financial stability](#)

Shouwei Li, Hu Wang & Xiaoxing Liu

Environmental Science and Pollution Research (2022)

[Corporate climate risk and stock market reaction to performance](#)

Your Privacy

We use cookies to make sure that our website works properly, as well as some 'optional' cookies to personalise content and advertising, provide social media features and analyse how people use our site. By accepting some or all optional cookies you give consent to the processing of your personal data, including transfer to third parties, some in countries outside of the European Economic Area that do not offer the same data protection standards as the country where you live. You can decide which optional cookies to accept by clicking on 'Manage Settings', where you can also find more information about how your personal data is processed. Further information can be found in our [privacy policy](#).

**Accept all
cookies**

[Manage preferences](#)

Your Privacy

We use cookies to make sure that our website works properly, as well as some 'optional' cookies to personalise content and advertising, provide social media features and analyse how people use our site. By accepting some or all optional cookies you give consent to the processing of your personal data, including transfer to third parties, some in countries outside of the European Economic Area that do not offer the same data protection standards as the country where you live. You can decide which optional cookies to accept by clicking on 'Manage Settings', where you can also find more information about how your personal data is processed. Further information can be found in our [privacy policy](#).

**Accept all
cookies**

[Manage preferences](#)