

# J Doyne Farmer

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## PROFESSIONAL INTERESTS

J. Doyne Farmer is Director of the Complexity Economics programme at the Institute for New Economic Thinking at the Oxford Martin School, Baillie Gifford Professor of Complex Systems Science at the Smith School of Enterprise and the Environment, University of Oxford, Senior Research Fellow at Christ Church College, Oxford and an External Professor at the Santa Fe Institute. His current research is in complex systems approaches to economics, including agent-based modeling, climate change, financial instability and technological progress. He was a founder of Prediction Company, a quantitative automated trading firm that was sold to UBS in 2006. His past research includes complex systems, dynamical systems theory, time series analysis and theoretical biology. In 1988 he founded the Complex Systems Group at Los Alamos National Laboratory. While a graduate student in the 1970s he and his colleagues built the first wearable digital computer, which was successfully used to predict the game of roulette.

## EMPLOYMENT

2020 – present **Macrocosm:** Director  
2012 - present **University of Oxford:** Director, Complexity Economics, The Institute for New Economic Thinking at the Oxford Martin School; Baillie Gifford Professor of Complex Systems Science at the Smith School of Enterprise and the Environment; Senior Research Fellow, Christ Church College; Associate Member of Nuffield College; Associate Member, Oxford Man Institute; Senior Associate, Oxford Net Zero  
**Santa Fe Institute:** External Professor  
2010 – 2012 **Potsdam Institute of Climate Change:** Distinguished Fellow  
1999 – 2012 **Santa Fe Institute:** Professor  
2007 – 2009 **LUISS Guido Carli, Rome:** Extraordinary Professor  
1991 – 1999 **Prediction Company:** Co-President, 1995-1999; Chief Scientist (Head of Research Group), 1991-1999  
1981-1991 **Los Alamos National Laboratory:** Leader of Complex Systems Group, Theoretical Division, 1988-1991; Staff Member, Theoretical Division, 1986-1988; Oppenheimer Fellow, Center for Nonlinear Studies, 1983-1986; Post-doctoral Appointment, Center for Nonlinear Studies, 1981-1983

## EDUCATION

1981 University of California, Santa Cruz: PhD in Physics  
1973 Stanford University: BS in Physics

## AWARDS AND FELLOWSHIPS

2011 Alexander von Humboldt Award  
1989 Los Alamos National Laboratory Fellows Prize  
1983-1986 J. Robert Oppenheimer Fellowship

## CONSULTANCIES

2019 – present IHS Markit advisory board  
2016 – present Consultant to European Central Bank  
2016 – present Invenia advisory board  
2016 – 2018 Plato Partnership (pro bono)  
2015 – 2019 Chairman of the Board of Directors, Scientific Investments  
2014 – present Research advisor to BMLLtech  
2015 Blakett Review, Fintech Futures, Government Office of Science, led by Sir Mark Wolport.  
2013 UK Treasury Study 'Future of Computer Trading', led by Sir John Beddington.

## COMMUNITY SERVICE

2004 – 2005 Monte del Sol High School, Mentor on Global Sustainability  
2002 – present Eli Farmer Fund, New Mexico Community Foundation  
1998 – 2007 Forest Guardians, Board of Directors (Board President, 2003–2007)

## SELECTED POPULAR PRESS (BOOKS ONLY)

- Adam Kucharski, *The Perfect Bet*, 2016
- Thomas Bass, *The Predictors: How a Band of Maverick Physicists Used Chaos Theory to Trade Their Way to a Fortune on Wall Street*, Penguin, 2001
- Mitchell Waldrup, *Complexity: The Emerging Science at the Edge of Order and Chaos*, Simon & Schuster, 1992
- James Gleick, *Chaos: Making a New Science*, Penguin, 1987
- Thomas Bass, *The Eudaemonic Pie*, Houghton Mifflin, 1985

## CITATION RECORD

45,363 citations; h-index = 83; 323 publications.

See <http://scholar.google.co.uk/citations?user=Rk7g1U0AAAAJ&hl=en>

## WIKIPEDIA PAGE

[https://en.wikipedia.org/wiki/J.\\_Doyne\\_Farmer](https://en.wikipedia.org/wiki/J._Doyne_Farmer)

## WORKING PAPERS

- Farmer, J.D., Geanakoplos, J., Richiardi, M.G., Montero, M., Perelló, J., Masoliver, J. (2023). Discounting the distant future: What do historical bond prices imply about the long term discount rate? arXiv:2312.17157
- Bücker, J., del Rio-Chanona, R.M., Pichler, A., Ives, M.C. & Farmer, J.D. (2023). 'Employment dynamics in a rapid decarbonization of the power sector'. INET Oxford Working Paper No. 2023-28.
- Berryman, A., Bücker, J., Senra de Moura, F., Barbrook-Johnson, P., Hanusch, M., Mealy, P., del Rio-Chanona, M. & Farmer, J.D. (2023). 'Modelling labour market transitions: the case of productivity shifts in Brazil'. Case study in: New Economics Models of Energy Innovation and Transition: Addressing new questions and providing better answers. EEIST Report.
- Wiersema, G., Kemp, E. & Farmer, J.D. (2023). 'Liquidity Spirals'. INET Oxford Working Paper No. 2023-16.
- Pangallo, M., Aleta, A., Chanona, R., Pichler, A., Martín-Corral, D., Chinazzi, M., Lafond, F., Ajelli, M., Moro, E., Moreno, Y., Vespignani, A., and Farmer, J.D. 'The unequal effects of the health-economy tradeoff during the COVID-19 pandemic'. arXiv:2212.03567 (2022).
- Dyer, J., Cannon, P., Farmer, J.D. & Schmon, S.M. 'Calibrating agent-based models to microdata with graph neural networks'. arXiv:2206.07570 (2022).
- Axtell, R.L. & Farmer, J.D. 'Agent-Based Modeling in Economics and Finance: Past, Present, and Future'. INET Oxford Working Paper No. 2022-10. <https://www.inet.ox.ac.uk/publications/no-2022-10-agent-based-modeling-in-economics-and-finance-past-present-and-future/> (2022)
- Yang, J., Heinrich, T., Winkler, J., Lafond, F., Koutroumpis, P & Farmer, J.D. 'Measuring productivity dispersion: a parametric approach using the Lévy alpha-stable distribution'. INET Oxford Working Paper No. 2019-14. <https://www.inet.ox.ac.uk/publications/no-2019-14-measuring-productivity-dispersion-a-parametric-approach-using-the-l%C3%A9vy-alpha-stable-distribution/> (2022).
- Dyer, J., Cannon, P., Farmer, J.D. & Schmon, S. (2022). 'Black-box Bayesian inference for economic agent-based models'. INET Oxford Working Paper No. 2022-05. <https://www.inet.ox.ac.uk/publications/no-2022-05-black-box-bayesian-inference-for-economic-agent-based-models/>
- Grubb, M. et al (2021). 'The New Economics of Innovation and Transition: Evaluating Opportunities and Risks'. EEIST Consortium Report. <https://eeist.co.uk/eeist-reports/>
- Kleinnijenhuis, A.M., Goodhart, C., & Farmer, J.D. 'Systemic implications of the bail-in design'. INET Oxford Working Paper No. 2021-21. <https://www.inet.ox.ac.uk/publications/systemic-implications-of-the-bail-in-design/> (2021).
- Pichler, A., Pangallo, M., del Rio-Chanona, R.M., Lafond, F. & Farmer, J.D. 'Production networks and epidemic spreading: How to restart the UK economy?' INET Oxford Working Paper No. 2020-12. <https://www.inet.ox.ac.uk/publications/no-2020-12-production-networks-and-epidemic-spreading-how-to-restart-the-uk-economy/> (May 2020)
- Farmer, J. D., Kleinnijenhuis, A. M., Nahai-Williamson, P. & Wetzter, T. 'Foundations of system-wide financial stress testing with heterogeneous institutions', <https://www.bankofengland.co.uk/working-paper/2020/foundations-of-system-wide-financial-stress-testing-with-heterogeneous-institutions> (May 2020)
- Pichler, A., Lafond, F. and Farmer J.D., 'Technological interdependencies predict innovation dynamics', <https://arxiv.org/abs/2003.00580> (February 2020).
- Wiersema, G., Kleinnijenhuis, A.M., Wetzter, T. & Farmer, J.D. 'Inherent Instability: Scenario-Free Analysis of Financial Systems with Interacting Contagion Channels' (2019).
- Mealy, P., Farmer, J.D. and Hausmann, R. 'Determining the Differences that Matter: Development and Divergence in US States Over 1850-2010', [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3235193](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3235193), (2018).
- Mealy, P., del Rio Chanona, R.M. and Farmer, J.D. 'What you do at work matters: New lenses on labour', [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3143064](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3143064) (2018).
- Baptista, R., Farmer, J.D., Hinterschweiger, M., Low, K., Tang, D., Uluc, A. 'Macroprudential Policy in an Agent-based Model of the Housing Market', Bank of England report No. 619, 2017 <http://www.bankofengland.co.uk/research/Pages/workingpapers/2016/swp619.aspx>
- Helbing, D., Mitleton-Kelly, E., Bouchaud, J-P., Caccioli, F., Farmer, J.D., Keen, S., Pistor, K., Snower, D.J., Olsen, R., Rinaldo, A., Haring, N., Fullbrook, E. 'How to Improve the Financial Architecture and its Resilience', [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2449874](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2449874) (2014).

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- Farmer, J.D., Geanakoplos, J., Masoliver, J., Montero, M., and Perello, J., 'Discounting the Distant Future', <http://lanl.arxiv.org/abs/1311.4068> (2013).
- Schwarzkopf, Y., and Farmer, J.D. 'The Cause of Universality in Growth Fluctuations', [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1597504](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1597504) (2010).  
Supporting Information: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1597505](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1597505).
- Schwarzkopf, Y., and Farmer, J.D. 'What Drives Mutual Fund Asset Concentration?' [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1173046](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1173046) (2010).
- Farmer, J. D., and Geanakoplos, J. 'Hyperbolic Discounting is Rational: Valuing the Far Future with Uncertain Discount Rates', [http://papers.ssrn.com/sol3/cf\\_dev/AbsByAuth.cfm?per\\_id=278280m](http://papers.ssrn.com/sol3/cf_dev/AbsByAuth.cfm?per_id=278280m) (2009).
- Farmer, J. D. 'Slippage 1996.' Technical Report, Prediction Company, Santa Fe, NM, 1996. <http://www.santafe.edu/~jdf/papers/slippage.pdf>

## RESEARCH PUBLICATIONS

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- Pichler A., Diem, C., Brintrup, A., Lafond, F., Magerman, G., Buiten, G., Choi, T.Y., Carvalho, V.M., Farmer, J.D., Thurner, S., (2023). Building an alliance to map global supply networks. *Science* 382,270-272. DOI:10.1126/science.adi75
- Quera-Bofarull, A., Dyer, J., Calinescu, A., Farmer, J.D. & Wooldridge, M.(2023). BlackBIRDS: Black-Box Inference for Differentiable Simulators. *Journal of Open Source Software*, 8(89), 5776. <https://doi.org/10.21105/joss.05776>.
- Barbrook-Johnson, P. et al. 'New economic models of energy innovation and transition'. Report 2023. <https://eeist.co.uk/eeist-reports/new-economic-models-of-energy-innovation-and-transition/>
- Mungo, L., Lafond, F., Astudillo-Estévez, P., Farmer, J.D. 'Reconstructing production networks using machine learning'. *Journal of Economic Dynamics and Control*, Volume 148, 2023, <https://doi.org/10.1016/j.jedc.2023.104607>.
- Pichler, A., Pangallo, M., del Rio-Chanona, R.M., Lafond, F. & Farmer, J.D. 'Forecasting the propagation of pandemic shocks with a dynamic input-output model'. *Journal of Economic Dynamics and Control*, Volume 144, November 2022, 104527. <https://doi.org/10.1016/j.jedc.2022.104527>
- Way, R., Ives, M.C., Mealy, P. & Farmer, J.D. 'Empirically grounded technology forecasts and the energy transition'. *Joule* 6, 1–26, 13 Sept 2022. <https://doi.org/10.1016/j.joule.2022.08.009>
- Carro, A., Hinterschweiger, M., Uluc, A., Farmer, J.D., 'Heterogeneous effects and spillovers of macroprudential policy in an agent-based model of the UK housing market', *Industrial and Corporate Change*, 2022, dtac030, <https://doi.org/10.1093/icc/dtac030>
- Lafond, F., Greenwald, D. & Farmer, J.D. 'Can Stimulating Demand Drive Costs Down? World War II as a Natural Experiment'. *The Journal of Economic History*, Vol 82, Issue 3, pp.727-764, doi:10.1017/S0022050722000249
- Masoliver, J., Montero, M., Perelló, J., Farmer, J.D., Geanakoplos, J. Valuing the Future and Discounting in Random Environments: A Review. *Entropy* 2022, 24, 496. <https://doi.org/10.3390/e24040496>
- Kolic, B., Sabuco, J. & Farmer, J.D. 'Estimating initial conditions for dynamical systems with incomplete information'. *Nonlinear Dynamics* 108, 3783–3805 (2022). <https://doi.org/10.1007/s11071-022-07365-y>
- Pangallo, M., Sanders, J.B.T., Galla, T., Farmer, J.D. 'Towards a taxonomy of learning dynamics in  $2 \times 2$  games'. *Games and Economic Behavior*, Volume 132, March 2022, Pages 1-21, <https://doi.org/10.1016/j.geb.2021.11.015>
- McNerney, J., Savoie, C., Caravelli, F., Carvalho, V.M, Farmer, J.D. 'How production networks amplify economic growth'. *Proceedings of the National Academy of Sciences* Jan 2022, 119 (1) e2106031118, DOI: 10.1073/pnas.2106031118
- Pichler, A. & Farmer, J. D., 'Simultaneous supply and demand constraints in input–output networks: the case of Covid-19 in Germany, Italy, and Spain.' *Economic Systems Research*, DOI: 10.1080/09535314.2021.1926934 (2021)
- Asano, Y.M., Kolb, J.J., Heitzig, J., and Farmer, J. D., 'Emergent inequality and business cycles in a simple behavioral macroeconomic model', *Proceedings of the National Academy of Sciences* DOI: 10.1073/pnas.2025721118 (2021)

- Scholl, M.P., Calinescu, A. and Farmer, J. D., 'How market ecology explains market malfunction', *Proceedings of the National Academy of Sciences of the United States of America* <https://doi.org/10.1073/pnas.2015574118> (2021)
- Heinrich, T., Sabuco, J. and Farmer, J.D., 'As simulation of the insurance industry: the problem of risk model homogeneity', *Journal of Economic Interaction and Coordination*, <https://doi.org/10.1007/s11403-021-00319-4> (2021).
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- del Rio-Chanona, R. M., Mealy, P., Pichler, A., Lafond, F. and Farmer, J. D., 'Supply and demand shocks in the COVID-19 pandemic: An industry and occupation perspective', *Oxford Review of Economic Policy*, graa033, <https://doi.org/10.1093/oxrep/graa033> (2020).
- Hepburn, C. and Farmer, J. D. 'Less precision, more truth: uncertainty in climate economics and macroprudential policy'. In *Handbook on the Economics of Climate Change*, 420-438. Eds Graciela Chichilnisky and Armon Rezai, Edward Elgar Publishing (2020).
- Lumsdaine, R.L, Rockmore, D.N., Foti, N., Leibon, G., Farmer, J.D. 'The Intrafirm Complexity of Systemically Important Financial Institutions', *Journal of Financial Stability* (2020).
- Perelló J., Montero, M., Masoliver, J., Farmer, J. D. and Geanakoplos, J., 'Statistical analysis and stochastic interest rate modeling for valuing the future with implications in climate change mitigation', *Journal of Statistical Mechanics: Theory and Experiment*, vol 2020 (2020).
- Pangallo, M., Heinrich, T. and Farmer, J.D. 'Best Reply Structure and Equilibrium Convergence in Generic Games', *Science Advances* 5, 2 eaat1328 (2019).
- Farmer, J. D., Hepburn, C., Ives, M.C., Hale, T., Wetzler, T., Mealy, P., Rafaty, R., Srivastav, S., Way, R. 'Sensitive intervention points in the post-carbon transition', *Science* 364, pages 132-134 (2019).
- Mealy, P., Farmer, J. D. and Teytelboym, A. 'Interpreting Economic Complexity', *Science Advances* 5, 1 (2019).
- Way, R., Lafond, F., Lillo F., Panchenko, V. and Farmer, J.D. 'Wright Meets Markowitz: How Standard Portfolio Theory Changes When Assets Are Technologies Following Experience Curves', *Journal of Economic Dynamics and Control* 101 April 2019, pages 211-238 (2019).
- Sanders, J.B.T., J. D. Farmer and T. Galla, 'The Prevalence of Chaotic Dynamics in Games With Many Players', to appear in *Scientific Reports* 8, 4902 (2018).
- Lafond, F., A.G. Bailey, J.D. Bakker, D. Rebois, R. Zadourian, P. McSharry, J.D. Farmer, 'How Well Do Experience Curves Predict Technological Progress? A Method for Making Distributional Forecasts', *Technological Forecasting and Social Change* (2018).
- Aymanns, Christoph, Fabio Caccioli, J.D. Farmer and Vincent Tan, 'Taming the Basel Leverage Cycle', *Journal of Financial Stability*, 27, 263-277, ISSN 1572-3089, <http://dx.doi.org/10.1016/j.jfs.2016.02.004> (2016)
- Farmer, J.D. and F. Lafond, 'How Predictable Is Technological Progress?', *Research Policy* 45, 647 – 655 (2016).
- Farmer, J.D., Alex Teytelboym, Penny Mealy, and Cameron Hepburn, 'A Third Wave in the Economics of Climate Change', *Environmental Resource Economics* 62, 2, 329 – 357 (2015).
- Zarinelli, Elia, Michele Trecciani, J.D. Farmer and F. Lillo, 'Beyond the Square Root: Evidence for Logarithmic Dependence of Market Impact on Size and Participation Rate', *Market Microstructure and Liquidity* 1,1 (2015).
- Farmer, J.D., John Geanakoplos, Jaume Masoliver, Miquel Montero and Josep Perello, 'Value of the Future: Discounting in Random Environments', *Physical Review E* 91, 052816 (2015).
- Tóth, Bence, Imon Palit, Fabrizio Lillo, and J. D Farmer, 'Why is Order Flow So Persistent?', *Journal of Economic Dynamics and Control* 51, 218-239 (2015).
- Caccioli, Fabio, J. D. Farmer, Nick Foti, and Dan Rockmore, 'Overlapping Portfolios, Contagion and Financial Stability' *Journal of Economic Dynamics and Control* 51, 50-63 (2015).
- Klimek, Peter, Sebastian Poledna, J.D. Farmer and S. Thurner, 'To Bail-out or Bail-in? Answers from an Agent-based Model', *Journal of Economic Dynamics and Control* 50, 144-154 (2015).
- Aymanns, Christoph and J. Doyne Farmer, 'Dynamics of the Leverage Cycle', *Journal of Economic Dynamics and Control* 50, 155-179 (2015).
- Hepburn, Cameron, Eric Beinhocker, J.D. Farmer and Alexander Teytelboym, 'Resilient and Inclusive Prosperity within Planetary Boundaries', *China and World Economy* 22 (5) 76-92 (2014).
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- Poledna, Sebastian, Stefan Thurner, J. Doyne Farmer, and John Geanakoplos, 'Leverage-induced Systemic Risk under Basle II and other Credit Risk Policies', *Journal of Banking & Finance* 42 (2014) 199–212.
- Farmer, J. Doyne, Austin Gerig, Fabrizio Lillo and Henri Waelbroeck, 'How Efficiency Shapes Market Impact', *Quantitative Finance*, (2013) 13:11, 1743-1758.
- Farmer, J. Doyne and Spyros Skouras, 'An Ecological Perspective On the Future of Computer Trading', *Quantitative Finance*, (2013) 13:3, 325-346, <http://dx.doi.org.10.1080/14697688.2012.757636>.

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- Farmer, J.D., 'Hypotheses Non Fingo: Problems with The Scientific Method in Economics', *Journal of Economic Methodology* 20 (4) 377-385 (2013).
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