

Curriculum Vitæ

Personal information

Surnames, first name

Nationality, date of birth

Postal address

Telephone

Email

Online academic IDs

CARRO PATIÑO, Adrián

Spanish, 14/01/1987

Banco de España,
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ORCID: [0000-0001-9838-3027](https://orcid.org/0000-0001-9838-3027)

ResearchGate: [Adrian_Carro](https://www.researchgate.net/profile/Adrian_Carro)

ResearcherID: [F-7290-2016](https://pubs.acs.org/doi/10.26434/chemrxiv-2016-f-7290)

Google Scholar: [Adrián Carro](https://scholar.google.com/citations?user=Adrián_Carro)

Research fields

Topics

Macroeconomics, real estate markets, macroprudential policy, financial stability and systemic risk

Methods

Agent-based modelling, network science, data science, complexity science

Work experience

Oct. 2019 – present

Banco de España, Financial Stability and Macroprudential Policy Department, Macroprudential Policy Division: Research Economist

Oct. 2016 – Sep. 2019

University of Oxford, Institute for New Economic Thinking (INET) at the Oxford Martin School: Postdoctoral Research Officer

Oct. 2016 – Sep. 2019

University of Oxford, Oxford Martin School: Oxford Martin Fellow

Nov. 2017 – Sep. 2019

Bank of England, Macro-Financial Risks Division: Visiting Fellow

Education

2011 – 2016

PhD in Physics, Universitat del les Illes Balears – CSIC, Institute for Cross-Disciplinary Physics and Complex Systems (IFISC). Advisors: Prof. Raül Toral, Prof. Maxi San Miguel
Thesis: [Individual-based models of collective dynamics in socio-economic systems](#)

2010 – 2011

MSc in Theoretical Physics of Complex Systems. Université Pierre et Marie Curie (Paris 6) and École Normale Supérieure. Advisor: Prof. Gérard Weisbuch

Thesis: [Sustainable development & spatial inhomogeneities: the role of transportation cost](#)

2005 – 2010

BSc in Physics. Universidade de Santiago de Compostela

Research projects and working papers

2019 – present

Prudential regulation of the UK banking and housing sectors: An agent-based modelling approach (with Bardoscia, M., Hinterschweiger, M., and Uluç, A.)

In collaboration with the Bank of England, we are introducing a well calibrated banking sector with heterogeneous banks into our previous agent-based model of the UK housing market. This would allow us to study the interactions between capital and product tools, both from a macro and a microprudential angle, thus enabling us to assess the effects of various policy tools on individual firms and types of borrowers.

2016 – present

Macroprudential policy in an agent-based model of the UK housing market (with Baptista, R., Farmer, J. D., Hinterschweiger, M., Low, K., Tang, D., and Uluç, A.)

In collaboration with the Bank of England, we have been developing an agent-based model of the UK housing market to study the impact of macroprudential policies on key housing market indicators. This approach enables us to tackle the heterogeneity in this market by modelling the individual behaviour and interactions of first-time buyers, home owners, buy-to-let investors, and renters from the bottom up, and observe the resulting aggregate dynamics in the property and credit markets. Since I joined the project in 2017 we have been working on a detailed calibration of the model, using a large selection of micro-data, mostly from household surveys and Zoopla, as well as on performing policy experiments. A series of comparative statics exercises have shown that, under the assumptions of the model, an increase in the size of the buy-to-let sector leads to an amplification of house price cycles and an increase in house price volatility. Finally, a loan-to-income portfolio limit was introduced as an example of macroprudential policy, leading to an attenuation of house price cycles.

Publications

Peer-reviewed journals
(8)

[Journal Citation
Reports, 2017; Scimago
Journal Rank, 2017]

Artime, O., Carro, A., Fernández-Peralta, A., Ramasco, J. J., San Miguel, M., Toral, R. (2019). Herding and idiosyncratic choices: Nonlinearity and aging-induced transitions in the noisy voter model. *Comptes Rendus Physique*, 20(6), 262

[Impact Factor: 2.892; Rank: 1st quartile journal in miscellaneous physics and astronomy]

Fernández-Peralta, A., Toral, R., Carro, A., San Miguel, M. (2018). Stochastic pair approximation treatment of the noisy voter model. *New Journal of Physics*, 20, 103045

[Impact Factor: 3.579; Rank: 1st quartile journal in miscellaneous physics and astronomy]

Fernández-Peralta, A., Toral, R., Carro, A., San Miguel, M. (2018). Analytical and numerical study of the non-linear noisy voter model on complex networks. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 28, 075516

[Impact Factor: 2.415; Rank: 18th journal in statistical and nonlinear physics]

Carro, A., Toral, R., San Miguel, M. (2016). Coupled dynamics of node and link states in complex networks: A model for language competition. *New Journal of Physics*, 18, 113056

[Impact Factor: 3.579; Rank: 1st quartile journal in miscellaneous physics and astronomy]

Carro, A., Toral, R., San Miguel, M., (2016). The noisy voter model on complex networks. *Scientific Reports*, 6, 24775

[Impact Factor: 4.122; Rank: 5th journal in multidisciplinary science]

Carro, A., Toral, R., San Miguel, M. (2015). Markets, Herding and Response to External Information. *PLoS ONE*, 10(7), e0133287

[Impact Factor: 2.766; Rank: 1st quartile journal in agricultural and biological sciences]

Carro, A., Vazquez, F., Toral, R., San Miguel, M. (2014). Fragmentation transition in a coevolving network with link-state dynamics. *Physical Review E*, 89(6), 062802

[Impact Factor: 2.284; Rank: 9th journal in statistical and nonlinear physics]

Carro, A., Toral, R., San Miguel, M. (2013). The role of noise and initial conditions in the asymptotic solution of a bounded confidence, continuous-opinion model. *Journal of Statistical Physics*, 151(1-2), 131-149

[Impact Factor: 1.496; Rank: 10th journal in statistical and nonlinear physics]

Peer-reviewed
conference proceedings
(1)

Taghawi-Nejad, D., Tanin, R. H., Del Rio Chanona, M. R., Carro, A., Farmer, J. D., Heinrich, T., Sabuco, J., Straka, M. J. (2017). ABCE: A python library for economic agent-based modeling. *International Conference on Social Informatics*, 17-30

Policy briefs and technical reports

Lord, A., Dunning, R., Dockerill, B., Burgess, G., Carro, A., Crook, T., Watkins, C., Whitehead, C. (2018). The Incidence, Value and Delivery of Planning Obligations and Community Infrastructure Levy in England in 2016-17. *Ministry of Housing, Communities and Local Government*

Conferences and workshops

- Jun. 2019 **WEHIA'19, 24th Workshop on Economic Science with Heterogeneous Interacting Agents, City, University of London, UK.** Talk: *The impact of transport infrastructure on housing markets: An agent-based modelling approach*
- Jun. 2018 **Seminar at the OECD, Paris, France.** Invited seminar: *Agent-based modelling for public policy: A housing market example*
- Jun. 2018 **Oxford Summer School on Economic Networks, University of Oxford, UK.** Invited lecture: *Network structure in simple agent-based models: analytical approaches*
- Jun. 2018 **Modelling Complex Urban Environments, University of Waterloo, Canada.** Invited lecture: *Emergence of boom and bust cycles in an agent-based model of the housing market.* Talk: *The impact of transport infrastructure on housing markets: An agent-based modelling approach*
- Sep. 2017 **Heterogeneous Agents and Agent-based Modelling: The Intersection of Policy and Research, Department of the Treasury, Washington, D.C., USA.** Organised by the Office of Financial Research (OFR), Brandeis University, and the Bank of England.
- Sep. 2017 **Course on agent-based modelling for policy (within the "10 years from the crash" programme), London, UK.** Invited talk: *Agent-based modelling for policy design: two housing market examples*
- Jul. 2017 **Urban Analytics Data Dive, Alan Turing Institute, London, UK.** Team awarded second place for the challenge "Where could we build more houses?"
- Feb. 2017 **Seminar at the Financial Computing & Analytics group, UCL, London, UK.** Invited talk: *Herding behaviour and financial markets: the role of topology and external information*
- Jan. 2017 **Industrial and Infrastructure Strategy post Brexit: Understanding the Issues and Managing the Risks and Uncertainty, London, UK.** Invited talk: *Using agent-based modelling to evaluate the benefits of infrastructure systems*
- Sep. 2016 **CCS'16, Conference on Complex Systems, Amsterdam, The Netherlands.** Talk: *The noisy voter model on complex networks.* Talk: *Coupled dynamics of node and link states: A model for language competition*
- Sep. 2015 **EC2015, Econophysics Colloquium, Prague, Czech Republic.** Talk: *Network effects on an agent-based market model with herding behavior*
- Jun. 2015 **IC2S2, International Conference on Computational Social Science, Helsinki, Finland.** Poster: *Markets, herding and response to external information.* Poster: *Coupled dynamics of node and link states: a model for language competition*
- Jun. 2013 **WEHIA'13, 18th Workshop on Economic Science with Heterogeneous Interacting Agents, Reykjavík University, Iceland.** Poster: *Network effects on the local and dynamic properties of an agent-based herding model*
- Jun. 2012 **WEHIA'12, 17th Workshop on Economic Science with Heterogeneous Interacting Agents, University of Pantheon-Assas Paris II, Paris, France.** Talk: *Stochastic resonance and diversity in an agent-based herding model*

Between 2011 and 2017

Apart from these, I also presented 8 posters, 9 talks, and 1 invited talk at 12 other national and international conferences and 4 summer schools (details available upon request)

Honours and awards

2012 – 2016

Scholarship of the Training Programme for Academic Staff (FPU). Funded by: Ministry of Education of Spain. Scholarship number: AP2012-0547. Personally awarded.

2009 – 2010

Undergraduate Research Fellowship. Funded by: Ministry of Education of Spain. Personally awarded.

Research visits

Jan. – Feb. 2019

University of Sydney, Centre for Complex Systems. Host: Prof. Mikhail Prokopenko

Jan. – Feb. 2018

University of Cape Town, African Institute of Financial Markets and Risk Management (AIFMRM). Host: Dr. Co-Pierre Georg

Apr. – Jun. 2016

University of Oxford, Institute for New Economic Thinking (INET) at the Oxford Martin School. Host: Prof. Doyne Farmer

Other professional activities

Teaching experience

Teaching Assistant for Statistical Mechanics (4th year undergraduate level), Universitat de les Illes Balears, Spain.

Supervision of 4 students on different undergraduate and postgraduate research projects, University of Oxford, UK.

Refereeing

Advances in Complex Systems, Environment and Planning B - Urban Analytics and City Science, Journal of Statistical Mechanics: Theory and Experiment, Language Dynamics and Change, Physica A, SocInfo2017 - International Conference on Social Informatics

Conference organisation

Co-organiser of the workshop “Young Researchers at the Crossroads” (2017), linked to the conference “Crossroads in Complex Systems”, Universitat de les Illes Balears, Spain.

Computer skills

Programming languages: Fortran, C/C++, Java, Python

Data analysis and graphing software: Python (Matplotlib, networkX, pandas)

Simulation methods: Molecular Dynamics, Monte Carlo, Agent-Based Simulation

Text processing and office packages: L^AT_EX, LibreOffice, Microsoft Office

Language skills

Mother tongue

Spanish

Foreign languages

English: C2 Proficient user **French:** C1 Proficient user **German:** A1 Basic user

Feb. 2013

DALF C1 test (Diplôme Approfondi de Langue Française). Score: 69.5 / 100

Alliance Française, Palma de Mallorca, Spain

Aug. 2008

IELTS test (International English Language Testing System). Band score: 7.5 / 9

Sheffield Hallam University, Sheffield, United Kingdom