CURRICULUM VITAE

Nuno Crato
Professor Catedrático (Full Prof.) of Statistics and Econometrics,
ISEG, Lisbon School of Economics & Management, University of Lisbon,
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RECENT AND PAST ACADEMIC SERVICES

2016–2018 – Visiting Scientist, European Commission Joint Research Center, Italy

2011–2015 – Minister of Education and Science, Portuguese Republic

2010–2011 – C.E.O. of Taguspark, S.A., Science and Technology Park, Portugal

2007–2011 – Dean (*Pró-reitor*) for Scientific Culture, Lisbon Technical University

2007–2010 – President and Scientific Coordinator of Cemapre Research Center, ISEG

2004–2010 – Portuguese Mathematical Society (SPM) President

1993–1994 – External consultant at the World Bank

1985–1988 – Technical Director for consulting, Norma-Açores

RESEARCH INTERESTS

Econometrics, time series analysis, probability models and applications, economics and statistics of education.

EDUCATION

2002 – Aggregation (Habilitation), Lisbon Technical University,

1992 – Ph.D. in Applied Mathematics at the Department of Mathematical Sciences of the University of Delaware. Dissertation "On some misspecification problems in long-memory fractional time series models"; advisor Prof. Howard M. Taylor

1985 – M.S. (mestrado) in Mathematical Methods for Management Decisions, Technical University of Lisbon. Thesis on Kalman filtering prediction; adviser Prof. Daniel Muller,

1981 – B.S. (licenciatura) in Economics, Technical Univ. of Lisbon

HONORS

2016 – National medal of the Portuguese Republic *Grã-Cruz,* Prince Henry Order

2008 – European Commission Science Award (ex-Descartes Prize) for Science Communication (2nd)

2008 – National medal of the Portuguese Republic *Comendador,* Prince Henry Order

2003 – Mathematics Public Awareness First Prize, European Mathematical Society

SELECTED GENERAL PUBLICATIONS

Crato, N. (Ed.), *Improving a Country's Education: PISA 2018 Results in 10 Countries*, Springer 2021. https://doi.org/10.1007/978-3-030-59031-4_1

Crato N. Setting up the Scene: Lessons Learned from PISA 2018 Statistics and Other International Student Assessments. In: Crato N. (eds) Improving a Country's Education. Springer, 2021.

Crato, N., Curriculum and Educational Reforms in Portugal: An Analysis on Why and How Students' Knowledge and Skills Improved, in *Audacious Education Purposes*, F. M. Reimers (Ed.), Springer, 209-31, 2020. https://doi.org/10.1007/978-3-030-41882-3_8

Crato, N. and Paruolo, P. (Eds.), *Data-Driven Policy Impact Evaluation: How Access to Microdata is Transforming Policy Design*, Springer 2019. https://doi.org/10.1007/978-3-319-78461-8

Crato, N. "A call to action for better data and better policy evaluation: A briefing on the importance of administrative data for social knowledge and policy evaluation at Big Data times", EUR 28434, Ispra, Italy, 2017. https://doi.org/doi:10.2760/738045

Behrends, E., Crato, N. and Rodrigues, J.F. (Eds.) *Raising Public Awareness of Mathematics*, Springer 2012.

SELECTED REFEREED PUBLICATIONS

Caiado, J., Crato, N. and Poncela, P. "A fragmented-periodogram approach for clustering big data time series", *Advances in Data Analysis and Classification*, 2019.

Diniz, A., Barreiros, J., and Crato, N. "A new model for explaining long-range correlations in human time interval production", *Computat. Statistics & Data Analysis* **56**, 1908–19, 2012.

Caiado, J., Crato, N., and Peña, D. "Tests for comparing time series of unequal lengths," *Journal of Statistical Computation and Simulation* **82**, 1715-1725, 2012.

Crato, N., Linhares, R.R., and Lopes, S.R.C. "α-stable laws for noncoding regions in DNA sequences", *Journal of Applied Statistics* **38**, 261–271, 2011.

Diniz, A., Barreiros, J., and Crato, N. "Parameterized estimation of long-range correlation and variance components in human serial interval production", *Motor Control* **14**, 26–43, 2010.

Crato, N., Linhares, R.R., and Lopes, S.R.C. "Statistical properties of detrended fluctuation analysis", *J. of Statistical Computation and Simulation* **80**, 6, 625–641, 2010.

Caiado, J. and Crato, N. "Identifying common dynamic features in stock returns", *Quantitative Finance* **10**, 7, 797–807, 2010.

Caiado, J., Crato, N., and Peña, D. "Comparison of time series with unequal length in the frequency domain" *Communications in Statistics: Simulation and Computat.* **8**, 527–542, 2009.

Carvalho, A., Crato, N., and Gomes, C. "A Generative Power-Law Search Tree Model", *Computers & Operations Research* **36**, 2376–2386, 2009.

Caiado, J., Crato, N. and Peña, D. "A periodogram-based metric for time series classification", *Computational Statistics & Data Analysis* **50,** 10, 2668–2684, 2006.

Borges, M.F., Santos, A., Crato, N., Mendes, H., and Mota, B. "Sardine regime shifts off Portugal: a time series analysis of catches and wind conditions", *Scientia Marina* **67**-1, 235–44, 2003.

Crato, N. and Ray, Bonnie K. "Semi-parametric smoothing estimators for long-memory processes with added noise", *Journal of Statistical Planning and Inference* **105**, 283–297, 2002.

Rammjee, R., Crato, N. and Ray, B.K. "A note on moving average forecasts of long memory processes with an application to quality control", *Int. J. Forecasting* **18**, 291–297, 2002.

Costa, A.A. and Crato, N. "Long-run versus short-run behaviour of the real exchange rates", *Applied Economics* **33**, 683–688, 2001.

Crato, N. "Estimation of the maximal moment exponent with censored data", *Communications in Statistics: Simulation and Computation* **29**, 1239–1254, 2000.

Crato, N. and Ray, Bonnie K. "Memory in returns and volatilities of commodity futures contracts", *The Journal of Futures Markets* **20**, 6, 525–544, 2000.

Gomes, C.P., Selman, B., Crato, N., and Kautz, H. "Heavy-tailed phenomena in satisfiability and constraint satisfaction problems", *Journal of Automated Research* **24**, 67–100, 2000.

Breidt, J. F., Crato, N., and de Lima, P. J. F., "On the detection and estimation of long-memory in stochastic volatility," *Journal of Econometrics* **83**, 325–348, 1998.

Gomes, C. P., Selman, B., and Crato, N., "Heavy-tailed probability distributions in combinatorial search", G. Smolka (Ed.), *Principles and Practice of Constraint Programming–CP 97*, Lecture Notes in Computer Science 1330, Springer, 121–135, 1997.

Crato, N. and de Lima, P. J. F., "On the power of underdifferencing and overdifferencing tests against nearly nonstationary alternatives", *Communications in Statistics: Simulation and Computation* **26**, 4, 1431–1446, 1997.

Crato, N. and Taylor, H. M., "Stationary persistent time series misspecified as nonstationary ARIMA," *Statistische Hefte/Statistical Papers* **37**, 215–223, 1996.

Crato, N., "Some results on the spectral analysis of nonstationary time series," *Portugaliæ Mathematica* **53**, 179–186, 1996.

Crato, N. and Ray, Bonnie K., "Model selection and forecasting for long-range dependent processes," *Journal of Forecasting* 15, 107–125, 1996.

Wu, Ping and Crato, N., "New tests for stationarity and parity reversion: evidence on New Zealand real exchange rates," *Empirical Economics* **20**, 599–613, 1995.

Crato, N. and Rothman, P., "A reappraisal of parity reversion for U.K. real exchange rates," *Applied Economics Letters* **1**, 9, 139–141, 1994.

Crato, N., "Some international evidence regarding the stochastic memory of stock returns," *Applied Financial Economics* **4**, 1, 33–39, 1994.

Crato, N. and de Lima, P., "Long-memory and nonlinearity: A time series analysis of US stock returns and volatilities," *Managerial Finance* **20**, 2/3, 49–67, 1994.

Crato, N. and Rothman, P., "A fractionally integration analysis of long-run behavior for U.S. macroeconomic time series," *Economics Letters* **45**, 3, 287–291, 1994.

Crato, N. and de Lima, P., "Long-range dependence in the conditional variance of stock returns," *Economics Letters* **45**, 3, 281–285, 1994.

Crato, N. and Lopes, A., "Forecasting price trends at Lisbon Stock Exchange," in *A Reappraisal of the Efficiency of Financial Markets,* Taylor, S. *et al.* Springer-Verlag, 1989.

OTHER SELECTED PUBLICATIONS

Crato, N., "Math curriculum matters: Statistical evidence and the Portuguese experience", *European Mathematical Society Magazine*, forthcoming, 2022.

Crato, N. and Ruiz, E., "Can we evaluate the predictability of financial markets?", *Int. Journal of Forecasting* **28**, 1–2, 2012.

Crato, N., "Pedro Nunes, Portuguese mathematician and cosmographer, *The Mathematical Intelligencer* **25**, 2003.

Crato, N. "A mild skepticism on nonlinear forecasting: Some comments on the paper by Harvill and Ray", *International Journal of Forecasting* **21–4**, p. 729, 2005.

Teles, P., Crato, N. and Wei, W.W.S. "The Use of Aggregate Time Series in Testing for Long Memory", *Bulletin of the International Statistical Institute*, 52nd Session, 1999, 341–342, 1999.

Breidt, J. F., Crato, N., and de Lima, P. J. F., "Modeling the persistent volatility of asset returns", Proceedings of the IEEE/IAFE Conference on Computational Intelligence for Financial Engineering (CIFEr'97), IEEE, Piscataway, NJ, 266–272, 1998.

Al-Hihi, Joni and Crato, N. "On the Behavior of Tanaka's Test in Presence of Fractionally Integrated Models," American Statistical Association, Proceedings of the Business and Economic Statistics Section, 183–186, 1998.

Crato, N. and Dowling-DaCosta, L. "On the behavior of some estimators for the index of stability", NJIT-CAMS Research Report 9899-6, 1998.

Crato, N. and de Lima, P., "Underdifferencing versus overdifferencing tests," American Statistical Association, Proc. of the Business and Economic Statistics Section, 60–65, 1995.

de Lima, P. and Crato, N., "Long-memory in stock returns and volatilities," *American Statistical Association, Proceedings of the Business and Economic Statistics Section*, 202–207, 1993.

Crato, N. "Long-memory time series misspecified as nonstationary ARIMA," *American Statistical Association, Proceedings of the Business and Economic Statistics Section*, 82–87, 1992.

SERVICE TO THE SCIENTIFIC COMMUNITY

2010-· – Founding member and organizer of LESE, Lisbon Economics and Statistics of Education, a biennial international gathering of economists and statisticians dedicated to scientific education research.

2016–2021 – Director, International Institute of Forecasters.

2011 – Guest editor, *International Journal of Forecasting*.

2000 – General Chair for the 20th International Symposium on Forecasting, ISF2000 International Institute of Forecasters.

2000 – Guest editor, *International Journal of Forecasting*.

1999–2001 – Board Member, International Forum of Portuguese Researchers (FIIP).

1997–2000 – Organizer of Arrábida Summer Time Series Workshops, jointly promoted by the NJIT Center for Applied Mathematics and Statistics and the ISEG Center for Applied Mathematics and Economics.

1994 – Guest editor, *Managerial Finance*.

SERVICE TO PUBLIC EDUCATION AND THE COMMUNITY

2021–· – Member of RCQE–UNESCO Advising Committee.

2020–· – External consultant for the World Bank and for BAIN

2019–· – Board Member of Fundação Francisco Manuel dos Santos, a charity dedicated to promote knowledge of the Portuguese society

2019–· – President of Iniciativa Educação, a charity dedicated to students education

2019 – Crato, N. "Everything starts with the curriculum" *ResearchED* **3**
https://researched.org.uk/2019/02/27/everything-starts-with-the-curriculum/

2018–· – Adviser of the Education and Human Resources Council of the United Arab Emirates government

2011–2015 – Portuguese Minister of Education and Science.

During this tenure, compulsory schooling was extended from nine to twelve years, English was made mandatory for seven consecutive school years, the dropout rate was reduced from c. 25% to 13.7%, retention rates improved, and Portuguese students achieved the best results ever in international surveys. In fourth grade Mathematics in TIMSS, Portuguese students scored higher than those from traditionally better ranked countries, such as Finland. And in PISA, 15-year-old students scored over the OECD average for the first time.

Among explanations for these successes, international observers have highlighted the introduction after 2012 of better organized more demanding standards, more rigourous systematic external student evaluations, incentives for schools based on students' improvements and results, and a wider school autonomy.

2011 – Crato, N. (editor), *Ensino da Matemática: Questões e Soluções,* [*Teaching Mathematics: Issues and Solutions*], Lisboa, Fundação Calouste Gulbenkian.

2009–2011 – Director, Education Program, Fundação Francisco Manuel dos Santos.

2006 – Crato, N. (coordinator), *Rómulo de Carvalho: Ser Professor* [*Rómulo de Carvalho: On Being a Teacher*], Lisboa, Gradiva.

2006 – Crato, N. (editor), *Desastre no Ensino da Matemática: Como Recuperar o Tempo Perdido* [*Failures in Math Teaching: How to Recover Lost Time*] Lisboa, SPM/Gradiva.

2006 – Crato, N. *O 'Eduquês' em Discurso Directo: Uma Crítica da Pedagogia Romântica e Construtivista* [*The 'Educationalism' in Direct Discourse: A Critique of Romantic and Constructivist Pedagogy*], Lisboa, Gradiva.

1997–2000 – Advisor of the Portuguese Students Club at NJIT.

1996–2000 – New Jersey Performing Arts Center advisor.

TEACHING EXPERIENCE

2010–· – Professor, Department of Mathematics, Instituto Superior de Economia e Gestão, Lisbon School of Economics & Management (ISEG), Lisbon.

2001–2010 – Associate Professor, Depart. of Mathematics, ISEG.

1997–2000 – Assistant Professor at the Department of Mathematical Sciences of the New Jersey Institute of Technology.

1992–1996 – Assistant Professor at the Department of Mathematical Sciences of the Stevens Institute of Technology.

1992–2010 – Guest lecturer for various short courses and for Summer courses in Statistics and Applied Time Series Analysis at Wellington Victoria Univ., New Zealand, Minas Gerais and Rio de Janeiro, Brazil, Universidad de Concepción, Chile.

1987–1988 – Instructor (Assistente), ISEG, UTL, Lisbon.

1985–1987 – Guest instructor (Assistente convidado), University of Azores.

1986–1987 – Guest lecturer, Ponta Delgada Nursing School.

1982–1985 and 1987–1988 – Guest instructor (Assistente convidado), ISEG, Lisbon.

1980–1982 – Teacher at the Dona Leonor High School, Lisbon.

SCIENTIFIC POPULARIZATION

2019 – Crato, N. and Tirapicos, L., *O Eclipse de Einstein – Einstein's Eclipse: From Lisbon and London to Sobral and the Island of Principe*, CTT 2019.

2010 – Crato, N., *Figuring It Out: Entertaining Encounters with Everyday Math,* London, New York, Springer.

2011 – Crato, N., *Passeggiata aleatoria – La scienza giorno per giorno: la tua dose quotidiana*, [*Random Walk*], Milano, Tropea.

2007 – *Passeio Aleatório*, [*Random Walk*], Lisboa, Gradiva.

2007 – Crato, N., Correia de Oliveira, F. e Metello de Nápoles, S. *Relógios de Sol* [*Sundials*], Lisboa, Edições CTT.

2006 – Crato, N., Santos, Carlos e Tirapicos, Luís. *A Espiral Dourada: Coelhos de Fibonacci, Pentagramas, Cifras e outros Mistérios Matemáticos d'O Código Da Vinci'* [*The Golden Spiral: Fibonacci Rabits, Pentagrams, Cyphers, and other Mathematical Mysteries of 'Da Vinci Code'*], Lisboa, Gradiva.

2006-2009 – Resident scientist for the radio program *3 minutos de Ciência* [*Three minutes of science*], Rádio Europa, Lisbon.

2005 – Providência, C., Crato, N., Paiva, M. & Fiolhais, C. *Ciência a Brincar 4: Descobre o Céu* [*Science Fun: Discover the Sky*], Lisboa, Bizâncio/Soc. Port. de Física.

2004–2008 – Resident scientist, TV program *4 × Science*, RTPN.

2004 – Crato, N., Reis, F. E & Tirapicos, L. *Trânsitos de Vénus: À Procura da Escala Exacta do Sistema Solar* [*Venus Transits: The Search for the Solar System Exact Scale*], Lisboa, Gradiva.

1996–2011 – Science columnist for the newspaper *Expresso*.

2001 – *Zodíaco: Constelações e Mitos*, Gradiva, Lisbon.

1999– *Eclipses!*, Gradiva, Lisbon.

LANGUAGES

Portuguese (native), French and English (fluent), Spanish and Italian (interm. user).