

# **On aggregation techniques for agent based models: understanding the presence of long term memory**

**Roy Cerqueti**

Department of Economic and Financial Institutions, Faculty of Economics,  
University of Macerata, Via Crescimbeni, 20-62100-Macerata, Italy

**Giulia Rotundo**

Department of Methods and Models for Economics, Territory and Finance  
Faculty of Economics  
Sapienza University of Rome, via del Castro Laurenziano 9, 00161 Roma, Italy

## **Abstract**

A key feature of Agent-based modeling is the understanding of the macroscopic behavior based on data at the microscopic level. Among the topics of interest is the long term behavior of the system, and most diffused studies focus on attractors and stability from a dynamical perspective. The study of the property of long term memory becomes relevant when past events continue to maintain their influence for the future evolution of the system, and the autocorrelation is not decaying fast. In turn, this is relevant for understanding the reaction of the system to shocks, and further information on the evolution of an economic system can be obtained analysing the agents populating the system itself. In this regard, it is worth focusing on the role played by the diversity between units. The analysis of the diversity has become a remarkable aspect of the decision theory for what concerning the selection of multiple elements belonging to different families of candidates. In some other contexts, diversity rules the connection among heterogeneous agents to share information and collaborate or compete. In this respect, the diversity may also be an indicator of the performance of the strategies in a dynamic optimization framework.

The aim of this talk is giving some insight on techniques for studying the long term memory as emergent property of systems composed by heterogeneous agents. The approach can be useful for further expansions and applications to models from Economics and Finance.

## **References**

1. R. Cerqueti, G. Rotundo (2012). The Role of Diversity in Persistence Aggregation. *INTERNATIONAL JOURNAL OF INTELLIGENT SYSTEMS*, vol. 27, pp. 176-187, ISSN: 1098-111X, doi: DOI: 10.1002/int.2151. IF 1.653. Codice ISI: WOS:000298596400007, codice Scopus: 2-s2.0-84855176831.
2. R. Cerqueti, G. Rotundo, Memory Property in Heterogeneously Populated Markets. In:

Springer series 'Studies in Fuzziness and Soft Computing' (R.R. Kacprzyk, J. Ed.): Greco, S., Marques Pereira, R.A., Squillante, M., Yager, R.R., Kacprzyk, J. (Eds.), 'Preferences and Decisions', Vol. 257, pp. 53-67 (2010). ISBN/ISSN: 978-3-642-15975-6.

3. R. Cerqueti, G. Rotundo, Dynamics of Financial Time Series in an Inhomogeneous Aggregation Framework. In: C. Perna and M Sibillo (eds.), Mathematical and Statistical Methods in Insurance and Finance, Springer (2007) 67-74 ISBN: 978-88-470-0703-1.

4. R. Cerqueti, G. Rotundo, Microeconomic modeling of financial time series with long term memory, Communicated to the conference C.I.F.E. (2003 IEEE International Conference on Computational Intelligence for Financial Engineering), sponsored by IEEE Neural Network Society and organised by the technical committee of Financial Engineering, held in Hong Kong, March 20th- 23th 2003, Proceedings 191-198, IEEE catalog number: 03TH8653, ISBN 0-7803-7654-4.