

Brought to you by [INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA](#)

Scopus

[Back](#)

Ergodicity of Replicator Equation with Historic Behavior Perturbation

[Qualitative Theory of Dynamical Systems](#) • Article • 2025 •

DOI: 10.1007/s12346-025-01329-4

[Mukhamedov, Farrukh](#)^a ; [Pah, Chin Hee](#)^b ; [Rosli, Azizi](#)^c ^a Department of Mathematical Sciences, College of Science, United Arab Emirates University, P.O. Box 15551, Abu Dhabi, Al Ain, United Arab Emirates[Show all information](#)

2 71th percentile

Citations

1.37

FWCI

[View PDF](#)[Full text](#) [Export](#) [Save to list](#)

Document	Impact	Cited by (2)	References (53)	Similar documents
----------	--------	--------------	-----------------	-------------------

Abstract

Stable and historical behaviours are common in dynamical systems studied within evolutionary game theory. This motivates the analysis of replicator equations obtained as convex combinations of two equations that display contrasting dynamical regimes. A canonical example is the evolutionary dynamics of the Rock–Paper–Scissors (RPS) game, whose payoff matrix generates a well-known replicator flow. Previous research has demonstrated that, depending on the parameter $\lambda \in [0,1]$, a convex combination of a regular replicator operator and a non-ergodic operator may inherit either regularity or non-ergodicity. The current study creates a simplified model that incorporates higher-order interaction components and a unique subclass of replicator equations. We demonstrate that

the resulting system is strictly non-ergodic at $\lambda=1$, yet displays an increasing propensity toward ergodicity as λ approaches 1 from below. Although the framework is presently restricted to a specialised family of models, it establishes a tractable setting for future investigations into the interplay between higher-order effects and ergodicity in evolutionary game dynamics. © The Author(s), under exclusive licence to Springer Nature Switzerland AG 2025.

Author keywords

Convex combination; Ergodic; Lotka-Volterra operator; Replicator equation; Stochastic

Funding details

Details about financial support for research, including funding sources and grant numbers as provided in academic publications.

Funding sponsor	Funding number	Acronym
United Arab Emirates University See opportunities by UAEU ↗	G00004962	UAEU
United Arab Emirates University See opportunities by UAEU ↗		UAEU
Ministry of Higher Education See opportunities by MOHE ↗	FRGS/1/2021/STG06/UIAM/02/5	MOHE
Ministry of Higher Education See opportunities by MOHE ↗		MOHE

Funding text

The first author (F.M.) thanks to the UAEU UPAR Grant No. G00004962 for support. Moreover, the authors would like to thank Ministry of Higher Education (MOHE) Fundamental Research Grant Scheme (FRGS) under the grant FRGS/1/2021/STG06/UIAM/02/5. The authors are greatly indebted to anonymous referees for their constructive comments/suggestions which substantially contributed to improving the quality and presentation of the present paper.

Corresponding authors

Corresponding
author

F. Mukhamedov

Affiliation

Department of Mathematical Sciences, College of Science, United Arab
Emirates University, P.O. Box 15551, Abu Dhabi, Al Ain, United Arab Emirates

Email address

farrukh.m@uaeu.ac.ae

© Copyright 2025 Elsevier B.V., All rights reserved.

Abstract

Author keywords

Funding details

Corresponding authors

About Scopus

[What is Scopus](#)

[Content coverage](#)

[Scopus blog](#)

[Scopus API](#)

[Privacy matters](#)

Language

[日本語版を表示する](#)

[查看简体中文版本](#)

[查看繁體中文版本](#)

[Просмотр версии на русском языке](#)

Customer Service

[Help](#)

[Tutorials](#)

[Contact us](#)

ELSEVIER[Terms and conditions](#) ↗ [Privacy policy](#) ↗ [Cookies settings](#)

All content on this site: Copyright © 2026 [Elsevier B.V.](#) ↗, its licensors, and contributors. All rights are reserved, including those for text and data mining, AI training, and similar technologies. For all open access content, the relevant licensing terms apply.

