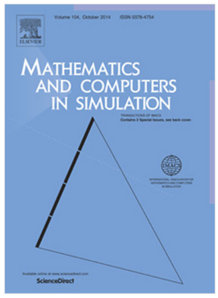
Accepted Manuscript



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PII: S0378-4754(18)30151-4
DOI: https://doi.org/10.1016/j.matcom.2018.06.006
Reference: MATCOM 4601

To appear in: *Mathematics and Computers in Simulation*

Received date : 22 December 2016
Revised date : 14 May 2018
Accepted date : 11 June 2018

Please cite this article as: W. Gao, L. Yan, M.H. Saeedi, H. Saberi Nik, Ultimate bound estimation set and chaos synchronization for a financial risk system, *Math. Comput. Simulation* (2018), https://doi.org/10.1016/j.matcom.2018.06.006

Ultimate bound estimation set and chaos synchronization for a financial risk system

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Abstract

In this paper, the ultimate boundary region of a financial risk system is studied through an optimization idea. For this system, the analytical expression of the ultimate boundary region are derived based on the optimization method and the Lagrange multiplier method. The ultimate bound which is useful in chaos synchronization are demonstrated through numerical simulations. Utilizing the bound obtained, a linear controller is proposed to achieve the chaos synchronization. All the numerical simulation results are in line with the theoretical analysis.

Keywords: Chaotic financial risk system, Ultimate bound, Lagrange multiplier method, Optimization, Synchronization.

1. Introduction

Chaotic systems, are sensitive to initial conditions and progress in a nonlinear behavior. This was explained earlier by the butterfly effect introduced by Edward Lorenz [1]. The chaotic economics is able to reveal ordered structures and regularity hidden in the seemingly random economic phenomena, and provides a way of understanding the complexity of economic phenomena as some of their own internal structures or purposive behaviors, rather than external or accidental behaviors. Safe and ordered financial condition is very important to support good social order and financial investiment. However, any financial investiment will suffer cerain finiancial risk. Therefore, it is important to approach potential dynamical models to discuss the occurred risks and predicte forthcoming financial risk on certain field. The occurrence of financial risk means disorder and invasion to futures trading, stock trading and commerical invesigation, and the risk can cause serious crisis on society. From dynamical view, the detectable and observable economic variable can show distinct chaotic behavior and should be controlled.

In economics, people working on stability and instability have flirted with bifurcation theory since the 1980s. This approach is really new and unexpected coming from this community. Indeed, working with chaotic systems is in opposition to most of the different concepts developed by macroeconomists, for instance, the neo-classical theory of Lucas, Sargent, Prescott, etc., the 'rational' theory which uses mainly linear concepts or, Keynes' theory which is not concerned with complex

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