Accepted Manuscript

Active control strategy for synchronization and anti-synchronization of a fractional chaotic financial system

Chengdai Huang, Jinde Cao

PII: S0378-4371(17)30009-2
DOI: http://dx.doi.org/10.1016/j.physa.2017.01.009
Reference: PHYSA 17902

To appear in: *Physica A*

Received date : 25 September 2016
Revised date : 23 November 2016

Please cite this article as: C. Huang, J. Cao, Active control strategy for synchronization and anti-synchronization of a fractional chaotic financial system, *Physica A* (2017), http://dx.doi.org/10.1016/j.physa.2017.01.009.

Active control strategy for synchronization and anti-synchronization of a fractional chaotic financial system

Chengdai Huang[a,*], Jinde Cao[b]

[a] *School of Mathematics and Computer Science, Hubei University of Arts and Science, Xiangyang 441053, China*

[b] *Research Center for Complex Systems and Network Sciences, and Department of Mathematics, Southeast University, Nanjing 210096, China*

Abstract

This paper is concerned with the issues of synchronization and anti-synchronization for fractional chaotic financial system with market confidence by taking advantage of active control approach. Some sufficient conditions are derived to guarantee the synchronization and anti-synchronization for the proposed fractional system. Moreover, the relationship between the order and synchronization(anti-synchronization) is demonstrated numerically. It reveals that synchronization(anti-synchronization) is faster as the order increases. Finally, two illustrative examples are exploited to verify the efficiency of the obtained theoretical results.

Keywords: Synchronization, Anti-synchronization, Stability, Fractional order, Financial chaotic system

1. Introduction

As is known to all, chaotic systems are tremendously complex nonlinear systems which have been extensively studied [1, 2, 3, 4]. The prominent features of these systems are that the extreme sensitivity to the initial conditions and changes of the system parameters. Chaos synchronization is a contemporary topic in nonlinear science because of its broad and considerable applications in secure communication, automatic control, neural networks and etc. The issues of synchronization of complex dynamical networks have been extensively studied since the pioneering work of Pecora and Carroll [5] due to its fruitful engineering applications in secure communication [6], signal processing [7], combinatorial optimization [8]. A lot of approaches based on the control theory have been proposed for the synchronization of complex networks, such as adaptive control [9], active control [10], sliding mode control[11], pinning control [12], intermittent control [13].

Fractional calculus provides an excellent tool for the description of memory and hereditary properties of various materials and process in comparison with classical integer-order derivatives [14, 15]. Synchronization of fractional order chaotic systems was first studied by Deng and Li [16]. Owing to slight initial transform of fractional order chaotic systems, system parameters and fractional order in any one can produce different chaotic signals. Therefore, based on the fractional order chaotic system, it can provide additional key information for image encryption system, achieve better effect of confidentiality, and further enhance the security of the secure communication system [17, 18]. Recently, synchronization of fractional-order chaotic systems has attracted a great deal of attention [10, 11, 19, 20, 21].

*Corresponding author. E-mail addresses: huangchengdai@163.com (C. Huang)