Accepted Manuscript

Periodic solution and ergodic stationary distribution of two stochastic SIQS epidemic systems

Haokun Qi, Shengqiang Zhang, Xinzhu Meng, Huanhe Dong

PII: S0378-4371(18)30621-6
DOI: https://doi.org/10.1016/j.physa.2018.05.075
Reference: PHYSA 19615

To appear in: *Physica A*

Received date : 16 March 2018
Revised date : 22 April 2018

Please cite this article as: H. Qi, S. Zhang, X. Meng, H. Dong, Periodic solution and ergodic stationary distribution of two stochastic SIQS epidemic systems, *Physica A* (2018), https://doi.org/10.1016/j.physa.2018.05.075

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Periodic solution and ergodic stationary distribution of two stochastic SIQS epidemic systems *

Haokun Qi[a†], Shengqiang Zhang[a], Xinzhu Meng[a,b‡], Huanhe Dong[a]

[a] *College of Mathematics and Systems Science, Shandong University of Science and Technology, Qingdao* 266590*, PR China*

[b] *State Key Laboratory of Mining Disaster Prevention and Control Co-founded by Shandong Province and the Ministry of Science and Technology, Shandong University of Science and Technology, Qingdao 266590, PR China*

Abstract

This paper proposes two stochastic SIQS epidemic models with periodic parameters and Markov switching. We first prove that the stochastic non-autonomous periodic system has a nontrivial positive periodic solution by using the Khasminskii's theory. Then the sufficient conditions for extinction of the disease are obtained. Furthermore, we construct suitable stochastic Lyapunov functions with regime switching to prove the existence of ergodic stationary distribution of the stochastic SIQS epidemic model. At last, some rigorous numerical simulations are presented to illustrate our theoretical results.

Keywords: Stochastic SIQS epidemic model; Periodic solution; Stationary distribution; Extinction; Markov switching

1 Introduction

Since Kermack and McKendrick proposed an epidemic compartmental model in the early 1900s [1], biological mathematical models have become important tools to understand the spread and control of infectious diseases. Some scholars have studied a various of biological mathematical models (such as SIS (see [2,3]) , SIR (see [4–6]), SEIR (see [7,8]) and others (see [9–14])) to seek effective measures to control the spread of infectious diseases. In fact, over the centuries quarantine has been the first

*This work was supported by the SDUST Research Fund (2014TDJH102), National Natural Science Foundation of China (11501331, 11561004), the Research Fund for the Taishan Scholar Project of Shandong Province of China, SDUST Innovation Fund for Graduate Students (SDKDYC180226).

†Email: haokun_2017@163.com

‡Corresponding author: Xinzhu Meng. Email: mxz721106@sdust.edu.cn.

Download English Version:

https://daneshyari.com/en/article/7374716

Download Persian Version:

https://daneshyari.com/article/7374716

Daneshyari.com