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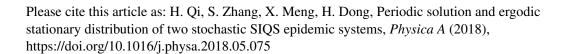
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Periodic solution and ergodic stationary distribution of two stochastic SIQS epidemic systems *

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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

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