Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **18 (2011)** 123-134
 http://www.watam.org

STABILITY OF THE SEMI-IMPLICIT EULER METHOD FOR A LINEAR IMPULSIVE STOCHASTIC DIFFERENTIAL EQUATION*

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Abstract. This paper deals with stability of the semi-implicit Euler method for a linear impulsive stochastic differential equation. The conditions under which the method is MS-stable and GMS-stable are determined and the numerical experiments are given.

Keywords. Impulsive stochastic differential equation; MS-stable; GMS-stable; Semi-implicit Euler method.

AMS (MOS) subject classification: 34A37; 60H10; 65L20.

1 Introduction

Impulsive effects exist widely in many evolution processes where states are changed abruptly at certain moments of time, involving such fields as medicine, biology, economics, mechanics, electronics and telecommunications, etc (see [3]). Recently, many interesting results on impulsive effects have been obtained [4, 6]. Besides impulsive effects, stochastic effects likewise exist in real system. It is very important in economics, biology, medicine and many of other fields. It has attracted the interests of many researchers [1, 2, 5, 7].

Therefore, it is necessary to consider the stability of solutions of stochastic impulsive differential equations. However, to the best of our knowledge, there are few results about this problem [9 – 12]. Like many other equations, explicit solutions can rarely be obtained for the impulsive stochastic differential equations. Thus, it is necessary to develop numerical methods and to study the properties of these methods.

In this paper, we consider the stability properties of the semi-implicit Euler method for a linear impulsive stochastic differential equation of the

* This paper is supported by the NSF of P.R. China (No.10671047)
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