

**Numerical Solutions for Reflected Stochastic Differential
Equations in \mathbb{R}_+**

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Introduction

In this thesis, we analyze Reflected Stochastic Differential Equation (RSDE) in the upper half space \mathbb{R}_+ . Various numerical schemes and methods for this kind of RSDE are surveyed, and exemplified by numerical experiments based on MATLAB programs. The thesis is divided into four chapters. A brief introduction to SDE, two discretization numerical schemes: Euler scheme, Milstein scheme, and also a numerical example is given in Chapter 1.

In Chapter 2, a brief introduction to RSDE in the upper half space \mathbb{R}_+ , and some different Euler-type schemes for RSDEs are given, with some numerical experiments.

In Chapter 3, a new algorithm for RSDE based on the splitting-step idea and penalization method is presented. Its convergence result is reported, a numerical scheme based the suggested algorithm is also given, and some numerical experiments are given to support this algorithm.

In Chapter 4, some Milstein-type schemes for RSDE (2.1.1) are presented, and numerical experiments for some RSDEs are done to compare the convergence rates of the corresponding Euler-type and Milstein-type schemes. These numerical experiments suggest that the presented Milstein-type schemes could not rise the convergence rate for numerical approximations for some RSDEs.