



# Uniqueness of Solutions to Fuzzy Differential Equations Driven by Liu's Process with Weak Lipschitz Coefficients

Samira Siahmansouri\*

Sama technical and vocational training college, Islamic Azad University, Varamin

## Abstract

Fuzzy differential equations (FDEs) is a type of differential equations driven by Liu process. These equations are frequently used in financial. This paper is devoted to build the existence and uniqueness theorem of solution to fuzzy differential equations which a fuzzy process in the sense of Liu. Under the Lipschitz condition, the linear growth condition is weak. Furthermore, the estimate for the error between approximate solution and accurate solution is given.

**Keywords:** Fuzzy differential equation, liu process, credibility space condition

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## 1 Introduction

In this paper, the following is considered fuzzy differential equation

$$dx(t) = f(t, x(t)) + g(t, x(t))d\mathbf{C}_t \quad (1)$$

where  $\mathbf{C}_t$  is Liu process,  $f, g$  are functions, and  $x(t)$  is the solution to the Eq. (1.1) which is a parameter of a fuzzy process. Existence and uniqueness of solution to the Eq. (1.1) by employing Lipschitz and linear growth conditions were studied by (A New Existence and Uniqueness Theorem for Fuzzy Differential Equations, [3]; Existence and Uniqueness Theorems for Fuzzy Differential Equations, [25]) and non-Lipschitz condition was explained by (Uniqueness of solutions to fuzzy differential equations driven by Liu's process with non-Lipschitz coefficients, [9]). However a little attention has been paid to weaker conditions, because we these weaker conditions, it opens a door to finding solutions for wider range of equations.

Furthermore, instead of Linear growth condition, a weaker condition was introduced, in order to solve of function such as  $-|x|^2x$ .

In this paper, a weak condition will be expressed, using this condition, some problems that are not solvable in linear growth condition can be solved. A new existence and uniqueness theorem will be prove in Section 2 and theorem will be prove for estimate of solution of equation (1.1).

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\*Speaker