46th Annual Iranian Mathematics Conference

25-28 August 2015

Yazd University

Talk Numerical solution of stochastic optimal control problems: experiences . . . pp.: 1–4

Numerical solution of stochastic optimal control problems: experiences from Merton portfolio selection model

B. Kafash*

Engineering Department, Ardakan University, Ardakan, Iran.

Abstract

In this paper, the variational iteration method (VIM), is applied for solving stochastic optimal control(SOC) problems. First, SOC problems are transferred to Hamilton-JacobiBellman (HJB) equation. Then, the basic VIM is applied to construct the value function and the corresponding optimal strategy. Also, we solve Merton's portfolio selection model as a problem of portfolio optimization to highlight the applications of SOC problems. Convergence of the method is proved by using Banach's fixed point theorem and some illustrative examples are presented to show the efficiency and reliability of the presented method.

Keywords: Stochastic optimal control(SOC) problems, Hamilton-Jacobi-Bellman (HJB) equation, Variational iteration method (VIM), Banach's fixed point theorem

Mathematics Subject Classification [2010]: 91G80, 93E20, 97M30

1 Introduction

Optimal controls models play a prominent role in a range of application areas, including aerospace, chemical engineering, robotic, economics and finance. It deals with the problem of finding a control law for a given system such that a certain optimality criterion is achieved. A controlled process is the solution to an ordinary differential equation which some parameters of the ordinary differential equation can be chosen. Hence, the trajectory of the solution is obtained. Each trajectory has an associated cost, and the optimal control problem is to minimize this cost over all choices of the control parameter. Stochastic optimal control is the stochastic extension of this; In fact, a stochastic differential equation with a control parameter is given. Each choice of the control parameter yields a different stochastic process as a solution to the stochastic differential equation. Each path wise trajectory of this stochastic process has an associated cost, and we seek to minimize the expected cost over all choices of the control parameter. Recently, Kushner has presented a survey of the early development of selected areas in nonlinear continuous-time stochastic control [1].

*Speaker