Abstract

Martingales are stochastic processes which model the `fair game', i.e., these are the processes where the expected value of the next term is equal to present observed term given that we have the knowledge of all past terms. The aim of the project is to understand this special class of stochastic processes with the continuous parameter time. Martingales are processes which have unbounded first variation. Due to this we cannot define the integration of a process with respect to martingales in the Lebesgue-Steiltjes sense. However, they have a bounded second variation. Using this we can show that integral of simple processes converge to the stochastic integration in L2 sense and this is how we define the stochastic integral with respect to continuous martingales. The construction of stochastic integral with respect to martingales has been carried out rigorously. Further I have discussed the change of variable formula (Ito's rule) which is important to understand the calculus of stochastic processes. Also in the end, there is a discussion on the existence and uniqueness of SDEs and under what conditions we can have a weak and strong solutions to the SDE with the given coefficients.