Valentin Tissot-Daguette

Princeton University, Bloomberg Ph.D Fellow

Title: “Itô Calculus for occupied processes: going with the flow”

Abstract

We introduce a calculus for functionals depending on the ”time” spent by a trajectory at arbitrary levels. A Markovian framework is recovered by lifting the underlying process with its flow of occupation measures. The resulting pair is dubbed the occupied process. While the occupation measure erases the chronology of the path, our framework still encompasses many problems in stochastic analysis and financial mathematics. Therefore, the study of occupied processes strikes a middle ground between the path-independent setting and the Functional Itô Calculus introduced by Dupire. We extend Itô’s and Feynman-Kac’s formula by replacing the usual time derivative with a tailored projection of the functional linear derivative used extensively in McKean-Vlasov control problems. We finally explore financial applications.