On the logistic stochastic differential equation

Pierre Vallois
Institut Elie Cartan de Lorraine, Universit de Lorraine
pierre.vallois@univ-lorraine.fr

We consider the logistic S.D.E which is obtained by addition of a diffusion coefficient of the type $\beta\sqrt{x}$ to the usual and deterministic Verhust-Volterra differential equation. We show that this S.D.E is the limit of a sequence of birth and death Markov chains. This permits to interpret the solution V_t as the size at time t of a self-controlled tumor which is submitted to a radiotherapy treatment. We mainly focus on the family of stopping times T_ε, where T_ε is the first hitting of level $\varepsilon > 0$ by (V_t). We calculate their Laplace transforms and also the first moment of T_ε. Finally we determine the asymptotic behavior of T_ε, as $\varepsilon \to 0$.

.