Perpetual American Options in a jump-diffusion model with random inspection

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Abstract

- We investigate the problem of pricing Perpetual American put and call options under the assumption that the option can be exercised only at random inspection times which are formulated by a Poisson Process. Employing an exponential Levy model for the price of the underlying asset, we specifically examine a jump-diffusion model with two-sided jumps. We present key identities to express the option's payoff and the exercise probability in terms of the undershoot/overshoot for the put/call scenarios. Additionally, we derive explicit formulas for the payoff, time until exercise and optimal exercise policy under two conditions for the log-price of the underlying asset: i) linear Brownian motion and ii) double exponential jump-diffusion process. Valuation under the risk-neutral probability measure is provided for both cases, along with asymptotic formulas yielding well-established results from continuous-time models. Our numerical examples illustrate the impact of inspection intensity on pricing outcomes for both scenarios.

Keywords: Perpetual American Options, linear Browinian motion, double exponential jump-diffusion process, Poissonian inspection, undershoot and overshoot.

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