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Stochastic Calculus for the Theta Process

A key step in stochastic analysis is the "art" of giving meaning to integrals against a random function. This is not a trivial task, since interesting random functions have poor regularity and Riemann-type approaches typically do not work. Sometimes, we may exploit the martingale-like properties of our random functions to give meaning to integrals against them. Alternatively, we may employ Rough Path Theory to define stochastic integration, trading some of the nice probabilistic properties for analytical and algebraic ones. I will outline how this is done in the case of the Theta Process. This is a stochastic process of number-theoretical origin that shares several (but not all!) properties with the Brownian Motion, and classical probabilistic tools to define a stochastic calculus for this process cannot be used. Joint work with Zachary Selk (https://arxiv.org/abs/2406.05523)