

Modeling Environmental, Social, and Governance Financial Assets with Lévy Subordinated Processes and Option Pricing

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Abstract : ESG stands for Environmental, Social, and Governance and is a non-financial factor that investors use to specify material risks and growth opportunities in their analysis process. ESG ratings provide a quantitative measure of socially responsible investment, and it is essential to incorporate ESG ratings when modeling the dynamics of asset returns. In this article, we propose a triple subordinated Lévy process for incorporating numeric ESG ratings into dynamic asset pricing theory to model the time series properties of the stock returns. The motivation for introducing three layers of subordinator is twofold. The first two layers of subordinator capture the skew and fat-tailed properties of the stock return distribution that cannot be explained well by the existing Lévy subordinated model. The third layer of the subordinator introduces ESG valuation and incorporates numeric ESG ratings into dynamic asset pricing theory and option pricing. We employ the triple subordinator Lévy model for developing the ESG-valued stock return model, derive the implied ESG score surfaces for Microsoft, Apple, and Amazon stock returns, and compare the shape of the ESG implied surface scores for these stocks.

Keywords : ESG scores, dynamic asset pricing theory, multiple subordinated modeling, Lévy processes, option pricing

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