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Stochastic Pricing Dynamics of Hard-to-Borrow Stocks

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Abstract

The 2010 "Quant of the Year" award from RISK Magazine was given to Marco Avellaneda of New York University for his "groundbreaking work on the effect of short-selling restrictions on price dynamics". He (with coauthor Mike Lipkin) introduced a new stochastic model that explains unusual pricing peculiarities observed in hard-to-borrow stocks. Because of the extreme brevity of their work, many claims were left unsubstantiated and properties left unexplored. Even to this day, the academic community has not expanded or built on the model. The purpose of this paper is to address this knowledge gap by laying the foundation the model and exploring its fundamental properties. This is done by analyzing both its mathematical properties and its effectiveness using real-world data.

This paper is split into three main sections. First, the regulatory landscape for short selling and hard- to-borrow stocks is explored. Second, the model is introduced under the motivation of existing SEC regulations. Several properties are explored including: risk neutral and martingale properties; long-term stability; and options pricing. Finally, the practical application of the model is assessed. This is accomplished though an extensive study of micro pricing data of US securities and a Monte Carlo implementation of the model.

This paper concludes that the majority of the claims made in the original paper are mathematically correct. It is also shown that implementing the model is burdened by computational and technical limitations that limit its practical effectiveness. Finally, the data indicates that many pricing phenomenon described by the model are infrequently observed. This leads the author to believe that hard-to-borrow pricing phenomenon is infrequently witnessed in the US stock market. Additional research using generally unobtainable data is needed to sufficiently substantiate this claim.

Keywords: Hard to Borrow Stocks, Options Pricing, Short Selling, Stochastic Models

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