Applying the Black-Scholes Model to Modern-Day American-Style Stock Options: A Novel Approach

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A stock option is a contract that grants the right to buy or sell an underlying stock at a predetermined price. In the United States, almost 20 million stock options are sold every trading day. In 1973, the Black-Scholes Model was developed to model the values of stock options. The most significant limitation of the Model is that it was only intended for use with European-style stock options, although it is widely used with American-style stock options. Although that is the most significant limitation, the Model has several other shortcomings as well. In this project, the Black-Scholes Model was applied to thousands of American-style stock options and the degree to which the Model fits the real world was evaluated. The results contradicted the hypothesis that the Black-Scholes Model would consistently under-predict the prices of American-style stock options. However, a closer look at the data revealed a much more complex pattern, one that was accurately modeled by generalized additive models, among other methods of statistical and machine learning analysis. It was found that American investors do not seem to be making their decisions most optimally and that the results of this project can be used to make better investment decisions that can ultimately benefit both institutions and individuals.