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THE PRICING OF OPTIONS ON DEBT SECURITIES

*Richard J. Rendleman, Jr., and Brit J. Bartter**

I. Introduction

In this paper we present a method for valuing American and European put and call options on debt securities. Although no exchange-traded options of this type currently exist in the United States, the Chicago Board Options Exchange plans to introduce option contracts on several government bonds, and the Chicago Board of Trade petitioned the Commodities Futures Trading Commission to allow the trading of options on the Ginny Mae futures contract. In addition to pricing put and call options, the model developed here can be applied to the valuation of other securities such as callable bonds and bank loan commitments.

In their seminal paper on option pricing, Black and Scholes [3] laid the groundwork for a general theory of contingent claim pricing which has since been applied to many problems in finance. The Black-Scholes model depends upon the assumption that the returns of the underlying security follow a stationary random walk through time. However, when the underlying security is a default-free bond, the price of the bond is not likely to follow any type of well-defined probability distribution due to the coupon and maturity effects specific to each instrument. As a result, the random returns of the bond will not, except in some special cases,¹ be stationary, thereby creating a need for an alternative option pricing methodology.

By assuming that the value of the instantaneous interest rate through time is stochastic and described by geometric Brownian motion, Brennan and Schwartz [4] were able to derive a differential equation for the pricing of interest-rate-related securities and options. They solved this equation numerically to

* Northwestern University. The authors wish to acknowledge Jonathan Ingersoll, Mark Rubinstein, Chester Spatt, and an anonymous referee for providing helpful comments on an earlier draft of the paper. Of course, any errors are the responsibility of the authors.

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