

Pricing Turbo Warrants

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The purpose of this paper is to price the financial contracts known as Turbo warrants. A turbo warrant is a warrant (stock-option) with a knock-out barrier. If the knock-out barrier is hit before maturity a rebate is payed. The rebates considered in the present paper are determined by the maximum or the minimum of the underlying process during a small time period after the barrier is hit.

The name turbo warrant first appeared in Germany at the end of 2001 as the name of a warrant having a knock-out level at the same level as the strike price. This type of instrument is however nothing else than a knock-out barrier option and can be priced as such. A more interesting situation appears when the barrier is strictly in the money and a rebate is payed if the barrier is hit. Such contracts were introduced at the end of February 2005 by Société Generale (SG). For turbo-call warrants (also called long turbos) the rebate is the difference between the lowest recorded stock-price during a three hour period after the barrier is hit and the strike price.

Closed form expressions for the price has been derived in paper [1] where the underlying process is considered to be geometric Brownian motion (GBM). If the underlying process is considered to be something other than GBM we have no analytical expression for the price and finding the price numerically is necessary.

In this paper we compare the accuracy and efficiency of two methods for numerical pricing of turbo warrants. A Monte Carlo method is used in the stochastic setting and formulating the problem in a PDE setting allows for the use of a Finite difference method to solve the problem. Studying the case with GBM allows for comparison of the numerical results with exact expressions which considerably simplifies the evaluation of the methods. Our results show that the finite difference method is up to 60 times faster than the Monte Carlo method.

References

[1] Eriksson J. (2005) *Explicit Pricing Formulas for Turbo Warrants (Preprint)*, Uppsala University