Abstract

American put option has existed for a long time. They cannot be valued by closed-form formula and require the use of numerical analysis methods and analytic approximations. There exists a great deal of methods for pricing American put option in related literatures. But a complete comparison of these methods is lacking. From literatures, we survey 27 methods and 186 commonly cited option contracts, including options on stock with dividend, non-dividend, in-the-money, at-money and out-of-money, short maturity and long maturity. In addition, we implement 14 methods, including lattice approaches, finite difference methods, Monte Carlo simulations and analytic approximations, and apply these methods to value the 186 option contracts above. From the numerical results, we summarize the advantages and disadvantages of each method in terms of speed and accuracy:

1. The binomial Black and Scholes with Richardson extrapolation of Broadie and Detemple (1996) and the extrapolated Flexible Binomial Model of Tian (1999) are both efficient improvements over the binomial method.

2. With root mean squared relative error about 1%, the analytic approximations are faster than the numerical analysis methods.

3. The Least-Squares Simulation method of Longstaff and Schwartz (2001) is not an effective method for pricing American put options.