# Financial Mathematics

MATH 5870/6870[1]
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[1] Based on Robert L. McDonald's *Derivatives Markets*, 3rd Ed, Pearson, 2013.

# Chapter 10. Binomial Option Pricing: Basic Concepts

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§ 10.1 A one-period Binomial tree

§ 10.2 Constructing a Binomial tree

§ 10.3 Two or more binomial periods

§ 10.4 Put options

§ 10.5 American options

§ 10.6 Options on other assets

§ 10.7 Problems

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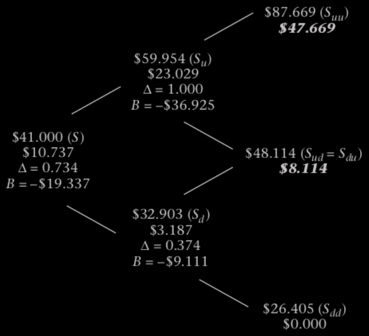
FIGURE 10.4

Binomial tree for pricing a European call option; assumes $S = \$41.00$, $K = \$40.00$, $\sigma = 0.30$, $r = 0.08$, $T = 2.00$ years, $\delta = 0.00$, and $h = 1.000$. At each node the stock price, option price, $\Delta$, and $B$ are given. Option prices in ***bold italic*** signify that exercise is optimal at that node.



Some observations:

- The option price is greater for the 2-year than for the 1-year option
- The option was priced by working backward through the binomial tree.
- The option's $\Delta$ and $B$ are different at different nodes. At a given point in time, $\Delta$ increases to 1 as we go further into the money
- Permitting early exercise would make no difference. At every node prior to expiration, the option price is greater than $S$–$K$; hence, we would not exercise even if the option had been American.

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Dividing the time to expiration into more periods allows us to generate a more realistic tree with a larger number of different values at expiration.

FIGURE 10.5

Binomial tree for pricing a European call option; assumes $S = \$41.00$, $K = \$40.00$, $\sigma = 0.30$, $r = 0.08$, $T = 1.00$ years, $\delta = 0.00$, and $h = 0.333$. At each node the stock price, option price, $\Delta$, and $B$ are given. Option prices in ***bold italic*** signify that exercise is optimal at that node.