

Option Contracts

Moneyness and intrinsic value

- ❖ **In the money option:** Is an option that would provide a positive payoff if exercised
- ❖ **Out of the money option:** Is an option that would provide a negative payoff if exercised
- ❖ **At the money option:** Is an option that would breakeven payoff if exercised

Valuation of Options

Option Valuation Models

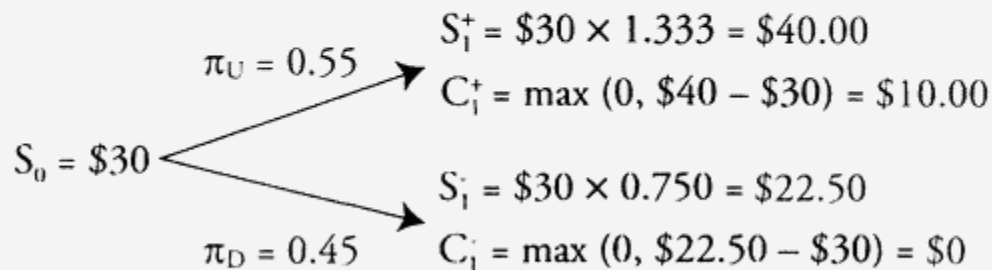
- ❖ Binomial model
- ❖ Black Scholes Merton Model (BSM)

Valuation of Options

Preview from Notesale.co.uk
Page 17 of 31

Let the stock values for the up-move and down-move be S_1^+ and S_1^- and for the call values, C_1^+ and C_1^- .

One-Period Call Option with $X = \$30$



Today

1 year

Valuation of Options

Preview from Notesale.co.uk
Page 23 of 31

We know the value of the option at expiration in each state is equal to $\max(0, \text{stock price} - \text{exercise price})$:

$$C_2^{++} = \max(0, \$78.13 - \$45.00) = \$33.13$$

$$C_2^{-+} = \max(0, \$50.00 - \$45.00) = \$5.00$$

$$C_2^{+-} = \max(0, \$50.00 - \$45.00) = \$5.00$$

$$C_2^{--} = \max(0, \$32.00 - \$45.00) = \$0$$

Valuation of Option Contracts

Now we know the value of the option in both the up-state (C_1^+) and the down-state (C_1^-) one period from now. To get the value of the option today, we simply apply our methodology one more time. Therefore, bringing (C_1^+) and (C_1^-) back one more period to the present, the *value of the call option today* is:

$$\begin{aligned} C_0 &= \frac{(\pi_U \times C^+) + (\pi_D \times C^-)}{1 + R_f} = \frac{E(\text{call option value})}{1 + R_f} \\ &= \frac{(0.6 \times \$20.45) + (0.4 \times \$2.80)}{1.07} \\ &= \frac{\$13.39}{1.07} = \$12.51 \end{aligned}$$