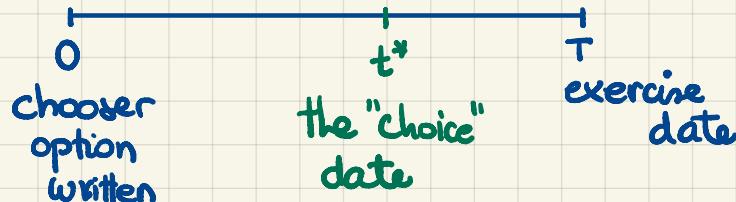


## Chooser Options (aka "as you like it" options).



K... strike price

At time  $t^*$ , the chooser option's owner decides whether the option becomes a call or a put (either way w/ strike K and exercise date T).

Assume that the owner is rational.

Notation:

$$\left\{ \begin{array}{l} V_{CH}(t, t^*, T) \\ \text{choice date} \\ \text{valuation date} \\ V_{CP}(t, T, K) \\ \text{exercise date, strike price} \end{array} \right.$$

$\Rightarrow V_{CH}(t^*, t^*, T) = \max(V_C(t^*, T, K), V_P(t^*, T, K))$

Our criterion

$$\Rightarrow V_{CH}(t^*, t^*, T) = \max(V_C(t^*, T, K), V_P(t^*, T, K))$$

$$\max(a, b) = a + \max(0, b-a) = a + (b-a)_+$$

$$= b + \max(a-b, 0) = b + (a-b)_+$$

$$V_{CH}(t^*, t^*, T) = V_C(t^*, T, K) + \underbrace{(V_P(t^*, T, K) - V_C(t^*, T, K))}_+ \quad \text{II Put-Call Parity}$$

$$PV_{t^*, T}(K) - S(t^*)$$

$$= V_C(t^*, T, K) + \underbrace{\left( Ke^{-r(T-t^*)} - S(t^*) \right)}_{= K^*}_+$$

Payoff of a European put w/ strike  $K^* = Ke^{-r(T-t^*)}$  and exercise date  $t^*$

=> A replicating portfolio for the chooser option:

- a long call w/ strike  $K$  and exercise date  $T$
- a long put w/ strike  $K^* = Ke^{-r(T-t^*)}$  and exercise date  $t^*$

$$\Rightarrow V_{CH}(0, t^*, T) = \underline{V_c(0, T, K)} + \underline{V_p(0, t^*, K^*)}$$
$$= \underline{V_p(0, T, K)} + \underline{V_c(0, t^*, K^*)}$$

20. Assume the Black-Scholes framework. Consider a stock, and a European call option and a European put option on the stock. The current stock price, call price, and put price are 45.00, 4.45, and 1.90, respectively.

Investor A purchases two calls and one put. Investor B purchases two calls and writes three puts.

The current elasticity of Investor A's portfolio is 5.0. The current delta of Investor B's portfolio is 3.4.

Calculate the current put-option elasticity.

- (A) -0.55
- (B) -1.15
- (C) -8.64
- (D) -13.03
- (E) -27.24

#### 21-24. DELETED

25. Consider a chooser option (also known as an as-you-like-it option) on a nondividend-paying stock. At time 1, its holder will choose whether it becomes a European call option or a European put option, each of which will expire at time 3 with a strike price of \$100. *t\* choice date* *T exercise date*

The chooser option price is \$20 at time  $t = 0$ .  $V_{CH}(0, 1, 3) = 20$

The stock price is \$95 at time  $t = 0$ . Let  $C(T)$  denote the price of a European call option at time  $t = 0$  on the stock expiring at time  $T$ ,  $T > 0$ , with a strike price of \$100.

You are given:

(i) The risk-free interest rate is 0.  $K^* = K$

(ii)  $C(1) = \$4$ .  $V_c(0, 1, K=100) = 4$

Determine  $C(3)$ .

$$V_c(0, 3, K=100) = ?$$

(A) \$ 9

(B) \$11

(C) \$13

(D) \$15

(E) \$17

$$V_{CH}(0, 1, 3) = 20 = V_c(0, 3, K=100) + V_p(0, 1, K^*=100)$$

? 11



$$V_c(0, 1, K^*=100)$$

+

$$PV_{0,1}(K^*)$$

-

$$S(0)$$

"

$$4 + 100 - 95 = 9$$