Handout 19: Numerical Examples of Put-Call Parity and Minimum Value

Corporate Finance, Sections 001 and 002

Notation:

C	Call price
P	Put price
S	Stock price
E	Exercise price
r	Continuously compounded interest rate
t	Time to expiration

We assume throughout that the stock pays no dividends.

1. Put-call parity is a relation between the price of a put, the price of a call, and the stock price. It holds both at expiration and prior to expiration. Put-call parity states that

$$C = S - Ee^{-rt} + P \tag{1}$$

Assume $S = \$110$, $E = \$100$, $r = 0$, $t =$ anything (because $r = 0$). Then (1) implies $C = \$110 - \$100 + P$. Therefore:

If $P = \$2$, then $C = \$12$

If $P = \$5$ then $C = \$15$.

2. A second option-pricing formula relates the price of a call to the stock price and the present value of the exercise price.

$$C \geq \max(0, S - Ee^{-rt}).$$

Like put-call parity, this relationship holds at or before expiration. The minimum value is greater than the intrinsic value $\max(0, S - E)$.

Suppose that $S = \$101$, $E = \$100$, $r = .06$, $t = 1$. Then

$$C \geq \max(0, 101 - 94.18) = 6.82.$$

Note: \$5.82 of the \$6.82 minimum value comes from the time value of money, and \$1.00 comes from the intrinsic value.

Question: Can the minimum value be used to show why you would never exercise an American call option on a non-dividend paying stock prior to expiration?

Both put-call parity, and the minimum value of a call are arbitrage relations, in the sense that if they do not hold, it is possible to construct a strategy that makes positive gains and has no possibility of losing money. If such a strategy were to exist, traders would exploit it immediately, and the relations would be restored.