Handout 19: Numerical Examples of Put-Call Parity and Minimum Value  
Corporate Finance, Sections 001 and 002

Notation:

\begin{align*}
C & \quad \text{Call price} \\
P & \quad \text{Put price} \\
S & \quad \text{Stock price} \\
E & \quad \text{Exercise price} \\
r & \quad \text{Continuously compounded interest rate} \\
t & \quad \text{Time to expiration}
\end{align*}

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

\[ C = S - E e^{-rt} + P \]  

(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.

\[ C \geq \max(0, S - E e^{-rt}) \]

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.