Put-call Parity

**Portfolio A**
- **LONG** European call w/ strike \( K \) and exercise date \( T \) and underlying \( S \)
- **SHORT** otherwise identical European put

**Initial cost**
\[
V_A(0) = V_C(0) - V_p(0)
\]

**Payoff**
\[
V_A(T) = \begin{cases} 
S(T) - K, & S(T) < K \\
S(T) - K, & S(T) \geq K 
\end{cases}
= S(T) - K
\]

**Portfolio B**
- **LONG** Prepaid forward on \( S \) w/ delivery date \( T \)
- Borrow \( PV_{0,T}(K) \) to be repaid at time-\( T \)

**Initial cost**
\[
V_B(0) = F_{0,T}^p(S) - PV_{0,T}(K)
\]

**Payoff**
\[
V_B(T) = ?
\]
\[
V_B(T) = S(T) - F_{0,T}(PV_{0,T}(K)) = S(T) - K
\]

\[\downarrow\]
\[
V_A(0) = V_B(0)
\]
\[ V_c(0) - V_p(0) = F_{0,T}^p(S) - PV_{0,T}(K) \]

**Put-call Parity**

\[ V_c(0) + PV_{0,T}(K) = F_{0,T}^p(S) + V_p^*(0) \]

\[ \text{call} + \text{cash} = \text{stock} + \text{put} \]
1. Consider a European call option and a European put option on a non-dividend-paying stock. You are given:

(i) The current price of the stock is 60.
(ii) The call option currently sells for 0.15 more than the put option.
(iii) Both the call option and put option will expire in 4 years.
(iv) Both the call option and put option have a strike price of 70.

Calculate the continuously compounded risk-free interest rate.

(A) 0.039
(B) 0.049
(C) 0.059
(D) 0.069
(E) 0.079
1. On April 30, 2007, a common stock is priced at $52.00. You are given the following:

(i) Dividends of equal amounts will be paid on June 30, 2007 and September 30, 2007.

(ii) A European call option on the stock with strike price of $50.00 expiring in six months sells for $4.50.

(iii) A European put option on the stock with strike price of $50.00 expiring in six months sells for $2.45.

(iv) The continuously compounded risk-free interest rate is 6%.

Calculate the amount of each dividend.

\[
V_c(0) - V_p(0) = S(0) - \sum_{k=1}^{n} D_k e^{-rt_k} - Ke^{-rT}
\]

(A) $0.51

(B) $0.73

(C) $1.01

(D) $1.23

(E) $1.45
Continuous-dividend paying stocks:

\[ V_c(0) - V_p(0) = S(0)e^{-\delta T} - Ke^{-rT} \]

* Quiz on Wed*

* Sections 3.1 and 9.1*