Put - call Parity

Portfolio A

- LONG European $\boxed{\text{call}}$ w/ strike K, exercise date T and underlying S.
- SHORT otherwise identical European $\boxed{\text{put}}$

Portfolio B

- LONG Prepaid forward on S w/ delivery date T

and

- Borrow $PV_{0,T}(K)$ to be repaid at time-T

Initial cost

$$V_A(0) = V_C(0) - V_P(0)$$

$$V_B(0) = F^P_{0,T}(S) - PV_{0,T}(K)$$

Payoff

$$V_A(T) = ?$$

$$V_A(T) = (S(T)-K)_+ - (K-S(T))_+$$

$$= \begin{cases} S(T)-K, & \text{if } S(T) \geq K \\ S(T)-K & \text{if } S(T) < K \end{cases}$$

$$= \underline{S(T)-K}$$

$$V_B(T) = ?$$

$$V_B(T) = S(T) - \cancel{FV_{0,T}}(\cancel{PV_{0,T}}(K))$$

$$= S(T) - K$$

$$\Downarrow$$

$$\boxed{V_A(0) = V_B(0)}$$

$$V_c(0) - V_p(0) = F^P_{0,T}(S) - PV_{0,T}(K) \quad (*)$$

<u>Put-call Parity</u>

$$V_c(0) + PV_{0,T}(K) = F^P_{0,T}(S) + V_p(0)$$

call + cash = stock + put

SAMPLE MFE

1. Consider a European call option and a European put option on a nondividend-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.

no dividends: $F^P_{0,T}(S) = S(0)$

(A) 0.039

(B) 0.049 $\quad r \quad PV_{0,T}(K) = Ke^{-rT}$

(C) 0.059

(D) 0.069 $\quad \boxed{V_c(0) - V_p(0) = S(0) - Ke^{-rT}}$

(E) 0.079

BEGINNING OF EXAMINATION
ACTUARIAL MODELS – FINANCIAL ECONOMICS SEGMENT

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.

discrete dividends:

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

(A) $0.51

(B) $0.73

(C) $1.01

(D) $1.23

(E) $1.45

Continuous-dividend paying stocks:

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

* <u>Quiz</u> on Wed *

* Sections <u>3.1</u> and 9.1 *