

HW2 (due April 15)

For all the following problems, we consider an investment of period T .

- (1) Suppose the delivery price K of a forward contract is **not** exactly the T -forward price, i.e.

$$K \neq S_0 e^{rT} \equiv K_T.$$

Show that the fair price of this forward contract is

$$S_0 - K e^{-rT}$$

for the long position.

- (2) Let C and P be the prices of the call and put options, respectively. Suppose the strike price K of the call and put options are **exactly** the same as the forward price of the underlying security. Show that $C = P$ following the discussion from Friday's lecture.
- (3) Suppose the strike price K of the call and put options are **not** the same as the T -forward price of the underlying security. Show that

$$C + K e^{-rT} = P + S_0$$

by analyzing the value of the portfolio (One call, minus one put and one short forward) and using Problem (1).

- (4) Let K_T be the T -forward price of one euro in the unit of USD. Let S_0 be the spot price of the euro. Suppose r_u and r_e are the interest rates earned in the euro and the dollar, respectively. Prove that

$$K_T = S_0 e^{(r_u - r_e)T}.$$

- (5) A call and put option on the same stock both expire in three months, both have a strike price of 20 and both sell for the price of 3. If the nominal continuously compounded annual interest rate is 10% and the stock price is currently 25, identify an arbitrage.