

Math Finance, Homework 2, Fall 2004
Due Wednesday, 1/18/06

1. Show that in the secondary market there exists an opportunity for a risk free profit if and only if there exists an arbitrage opportunity.
2. Consider a Single-period Binomial Model with $r = 1/3$, $S_0 = 2$, $d = 5/4$, $u = 3/2$, and $p = 3/5$.
 - a. Compute B_0 and B_1 .
 - b. Compute $S_1(\omega_1)$ and $S_1(\omega_2)$, and the probability of each outcome.
 - c. Draw a tree diagram representing the possible outcomes of (S_0, S_1) and the respective probability associated with each branch.
 - d. For the trading strategy $\phi = (2, 5)$, compute $V_0(\phi)$, $V_1(\phi)(\omega_1)$, and $V_1(\phi)(\omega_2)$.
 - e. Let X be a European call option with strike price \$2.75 and expiration time 1.
 - i. Find $X(\omega_1)$ and $X(\omega_2)$.
 - ii. Find the replicating strategy for X
 - iii. Find the manufacturing cost for X .
 - f. In each case below, give an example of arbitrage opportunity ψ . Note you must verify that your example satisfies the conditions for arbitrage.
 - i. $C_0 = 1$;
 - ii. $C_0 = 1/32$.
3. Consider a Single-period Binomial Model with $r = 1/4$, $S_0 = 3$, $d = 1$, $u = 2$, and $p = 3/4$.
 - a. Compute B_0 and B_1 .
 - b. Compute $S_1(\omega_1)$ and $S_1(\omega_2)$, and the probability of each outcome.
 - c. Draw a tree diagram representing the possible outcomes of (S_0, S_1) and the respective probability associated with each branch.
 - d. For the trading strategy $\phi = (3, 2)$, compute $V_0(\phi)$, $V_1(\phi)(\omega_1)$, and $V_1(\phi)(\omega_2)$.
 - e. Let X be a European put option with strike price \$5 and expiration time 1.
 - i. Find $X(\omega_1)$ and $X(\omega_2)$.
 - ii. Find the replicating strategy for X .
 - iii. Find the manufacturing cost for X .
 - f. In each case below, give an example of arbitrage opportunity ψ . Note you must verify that your example satisfies the conditions for arbitrage.
 - i. $C_0 = 2$;
 - ii. $C_0 = 1$.