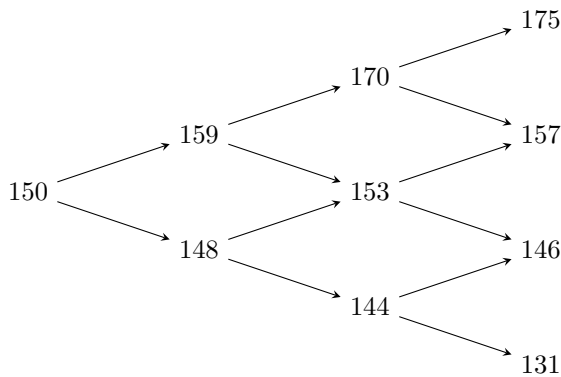


## Stat 346 Homework #10

### Homework Questions

1. A call option has a strike price of \$60 and expires in 10 months. The profit of the call option when the spot price at expiration is \$64 is \$2.12. What is the profit of the call option if the spot price at expiration is \$56? [-1.88]
2. For a 2-year put option priced with a 4 period binomial tree you are given that  $P_{d^4} = 31.12$ ,  $P_{ud^3} = 15.87$ ,  $P_{u^2d^2} = 3.91$  and  $P_{u^3d} = P_{u^4} = 0$ . The risk free interest rate is  $r = 0.04$  and  $p = 0.7143$ . What is the premium of the put option? [2.07]
3. Determine the price of a 1-year 22-strike European call option using Black Scholes for a stock with an initial stock price of 25 and a volatility of  $\sigma = 0.10$ . The risk free interest rate is  $r = 0.04$ . [3.91]
4. How would you delta hedge your position if you purchased the option in Problem 3? [Short sell 0.958 shares of stock]
5. Determine the price of a 3 month 40-strike European put option using Black Scholes for a stock with an initial stock price of 38 and a volatility of  $\sigma = 0.15$ . The risk free interest rate is  $r = 0.06$ .
6. How would you delta hedge your position if you purchased the option in Problem 5?
7. The volatility for a stock is unknown and  $r = 0.04$ . The initial stock price is \$110. If a 108-strike 8 month call option has a premium of \$10.36 under a Black Scholes framework and it is known that  $d_1 = 0.34$ . What is the volatility of the stock? [22%]
8. The following is a stock price tree for a particular stock using  $h = 4/12$



The probability of moving up is  $p = 0.4$ . The interest rate is  $r = 0.05$ . Using this stock price tree, determine the price of a 1 year European call option with a strike price of 147.

9. Suppose instead you wish to purchase an 8-month call option with strike price of 147. Using the tree in problem 8, what would the price be?

### Review Questions

Below are the summaries for each accident, including the accident year, policy year, payments made, and case reserves by year.

### Accident 1

- Date of Accident: June 15, 2011
- Policy Written: January 10, 2011

Year	Payments Made (\$)	Case Reserves (\$)
2011	5,000	7,000
2012	4,500	3,000
2013	2,000	1,500

### Accident 2

- Date of Accident: March 22, 2012
- Policy Written: December 5, 2011

Year	Payments Made (\$)	Case Reserves (\$)
2012	4,000	5,000
2013	3,000	3,500

### Accident 3

- Date of Accident: November 8, 2012
- Policy Written: July 15, 2012

Year	Payments Made (\$)	Case Reserves (\$)
2012	1,500	2,000
2013	2,500	2,000

### Accident 4

- Date of Accident: July 4, 2013
- Policy Written: February 20, 2013

Year	Payments Made (\$)	Case Reserves (\$)
2013	4,000	2,000

### Accident 5

- Date of Accident: December 15, 2013
- Policy Written: May 30, 2013

Year	Payments Made (\$)	Case Reserves (\$)
2013	3,500	4,500

10. Determine the following:

- (a) Calendar year 2013 losses [18,500]

- (b) Accident year 2012 losses as of Dec 1, 2013 [16,500]  
(c) Policy year 2011 losses as of Dec 1, 2013 [23,500]

11. Construct a cumulative claims triangle for incurred losses based on only these claims.

Accident Year	Dev Year 0	Dev Year 1	Dev Year 2
2011	12,000	12,500	13,000
2012	12,500	16,500	-
2013	14,000	-	-

12. Find loss development factors for this claims triangle using simple averages. [1/0: 1.18; 2/1: 1.04]  
13. Assume a tail factor of 1.01. Determine ultimate losses for the years 2012 and 2013 using the claims triangle method. [2012: 17160; 2013: 17192.93]  
14. Based on this results, what is IBNR for accident year 2013? [3192.93]  
15. Based on this results, what are total reserves for accident year 2013? [9692.93]  
16. Now assume that we have a trend for losses of  $\delta = 0.02$ . Based on these losses, if we were to use a weighted average of 80% of 2013 ultimate losses and 20% of 2012 ultimate losses, what would losses be when trended to policy year 2015? [18140.39]  
17. Suppose we have total fixed expenses of 100 and 4 exposure units. If the permissible loss ratio is 80%, what would the rate be for the 2015 policy using the loss cost method? [5700.12]