

Corporate Investment Appraisal Masters in Finance 2014-2015 Fall Semester Clara C Raposo

Problem Set 3: Valuation of Financial Options

Guidelines to Solutions

 The annual volatility of the return of company CJ's stock is 40%. Currently CJ's stock price is €4.25. The risk-free interest rate is 2% per annum (continuous).

Stock	
Sigma	0,4
S	4,25

Interest R	late
Rf	2%

- (a) Compute the risk neutral probability of the scenario "up" in the context of the binomial model (1 year time step).
- U 1,491825 D 0,67032 P 0,425903
 - (b) What is the value of a European call option on a share of company CJ, with a strike price of €5.2 and time to maturity of 1 year? Use the binomial model.

Call				
K	5,2			
Т	1			
		-		
Stock Tre	е	Year	0	1
			4,25	6,340255
				2,84886
Call				
Tree		Year	0	1
			0,476022	1,140255
				0

(c) Estimate the value of a put option on a share of company CJ, with expiry date in 3 years time and an exercise price of €5.0.

Put						
К	5					
Т	3					
Stock Tre	е	Year	0	1	2	3
			4,25	6,340255	9,458549	14,1105
				2,84886	4,25	6,340255
					1,909648	2,84886
						1,280075
Put Tree		Year	0	1	2	3
			1,516003	0,681189	0	0
				2,188668	1,210509	0
					2,991345	2,15114
						3,719925

 The shares of firm MC have an annual volatility of 30% and are currently priced at \$5.0. There is no expectation of a dividend in the coming year. The riskless annual interest rate is 3% (continuous).

Stock	
Sigma	30%
S	5
Interest	
Rate	
Rf	3%

(a) What is the value (BS) of a call option on share of firm MC, for a maturity of 1 year and an exercise price of \$6.5?

Call		
Т	1	year
К	6,5	

Using Black-Scholes

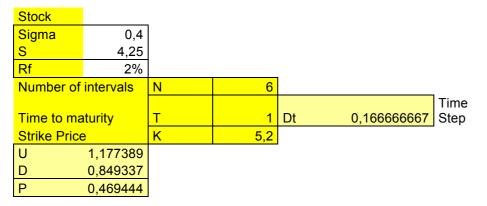
d1	-0,62455
d2	-0,92455
N(d1)	0,266134
N(d2)	0,177601
Call	0,210384

(b) What is the value (BS) of a European put option on a share of Firm MC, with expiry date in 5 months time, and with an exercise price of \$6.5?

Put	
Т	0,42 6,5
К	6,5
	. <u></u>
d1	-1,19347
d2	-1,38712
N(d1)	0,116343
N(d2)	0,082703
Call	0,05
Put	1,47

 Consider again the data of problem 1, regarding company CJ: The annual stock volatility is 40% and the stock price is currently €4.25. No dividend is expected for the coming year. The riskless annual interest rate is 2% (continuous).

Re-compute the value of a call option with maturity of 1 year, with an exercise price of \in 5.2, based on the binomial model, considering bi-monthly intervals (each branch is 2 months long).



Stock Tree

	•						
Month	0	2	4	6	8	10	12
	4,25	5,003903	5,891541	6,936636	8,167119266	9,615877	11,32163
		3,609682	4,25	5,003903	5,89154113	6,936636	8,167119
			3,065836	3,609682	4,25	5,003903	5,891541
				2,603928	3,065836188	3,609682	4,25
					2,211612126	2,603928	3,065836
						1,878404	2,211612
							1,595398
Call Tree							
	0,414304	0,711271	1,190167	1,928844	3,001670634	4,433181	6,121628
		0,154152	0,292013	0,544065	0,991731252	1,75394	2,967119
			0,033141	0,070831	0,151387337	0,323559	0,691541
				0	0	0	0
					0	0	0
						0	0
							0