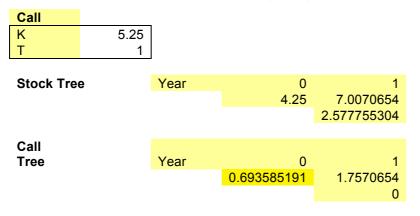Corporate Investment Appraisal

Masters in Finance

2012-2013

Fall Semester

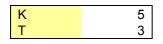Clara C Raposo

Problem Set 3: Valuation of Financial Options

1. The annual volatility of the return of company CJ's stock is 50%. Currently CJ's stock price is €4.25. The risk-free interest rate is 3% per annum (continuous).

(a) Compute the risk neutral probability of the scenario "up" in the context of the binomial model (1 year time step).

u	1.648721271
d	0.60653066
p	0.406762323

(b) What is the value of a European call option on a share of company CJ, with a strike price of €5.25 and time to maturity of 1 year? Use the binomial model.

Call	
K	5.25
T	1

Stock Tree	Year	0	1
		4.25	7.0070654
			2.577755304

Call Tree	Year	0	1
		0.693585191	1.7570654
			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.

K	5
T	3

Stock Tree	Year	0	1	2	3
		4.25	7.0070654	11.55269777	19.04717855
			2.577755304	4.25	7.0070654
				1.563487625	2.577755304
					0.948303181

Put Tree	Year	0	1	2	3
		1.723817963	0.802819283	0	0
			2.443808705	1.394498028	0
				3.288740043	2.422244696
					4.051696819

2. The shares of firm MC have an annual volatility of 40% and are currently priced at $4.0. There is no expectation of a dividend in the coming year. The riskless annual interest rate is 3% (continuous).

(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 $6.0?

Call

T	1	year
K	6	

Using Black-Scholes

d1	-0.73866277
d2	-1.13866277

N(d1)	0.230055899
N(d2)	0.127421918

Call	0.178287407

(b) What is the value (BS) of a European put option on a share of Firm MC, with expiry date in 8 months time, and with an exercise price of $6.0?

Put

T	0.67
K	6

d1	-1.016941719
d2	-1.343540352

N(d1)	0.154590578
N(d2)	0.089548535

Call	0.09
Put	1.97

3. Consider again the data of problem 1, regarding company CJ: The annual stock volatility is 50% and the stock price is currently €4.25. No dividend is expected for the coming year. The riskless annual interest rate is 3% (continuous).

Re-compute the value of a call option with maturity of 1 year, with an exercise price of €5.25, based on the binomial model, considering intervals of four months (each branch is 4 months long).

Stock	
Sigma	0.5
S	4.25

Rf	3%

Number of intervals	N	3		
				0.33
				3333 Time
Time to maturity	T	1	Dt	333 Step
Strike Price	K	5.25		
u	1.334658074			
d	0.749255573			

p	0.445496208

Stock Tree

Month	0	4	8	12
	4.25	5.672296814	7.57057674	10.10413137
		3.184336186	4.25	5.672296814
			2.385881634	3.184336186
				1.787635111

Call Tree

Month	0	4	8	12
	0.55180128	1.148816044	2.372815113	4.85413137
		0.08215234	0.186259688	0.422296814
			0	0
				0