FINANCIAL RISK MANAGEMENT 28.2.2013

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1. The current asset price is $S_0 = 10.00$, the asset price volatility is $\sigma = 0.28$, the expected asset return is $\mu = 0.09$, and the risk-free interest rate is $r = 0.05$. Determine

a) the expected asset price and the asset price standard deviation at the end of a six-month period,

b) the probability that the asset price falls below 8 euros at the end of a six-month period.

2. The current asset price is $S_0 = 10.00$, the asset price volatility is $\sigma = 0.28$, the expected asset return is $\mu = 0.09$, and the risk-free interest rate is $r = 0.05$. Determine

a) the value of an already existing *short* forward contract with the delivery price of $K = 9$, and the remaining time-to-maturity of six months.

b) the value of the contract above, after three months, the asset price being 11.00 at that time. The expected asset return and volatility, as well as the risk-free interest rate, remain on the original level.

3. You are about to receive a \$100'000 payment and want to hedge against a decline in the euro-quoted exchange rate by using a euro-quoted USD option. You choose the insurance level of 0.80 euros per dollar. One contract is on \$20'000, and the current put option price, with a strike of 0.80 EUR/USD, is 10 eurocents..

a) How many contrats you need to buy, and how much you need to pay for them today?

b) Assume that the exchange rate is 0.70 at the maturity of the contract. What is the payoff from your option position, and how much you get from your \$100'000 in euros, if you reveive the payment at the same time?

c) Assume that the exchange rate is 0.95 at the maturity of the contract. What is the payoff from your option position, and how much you get from your \$100'000 in euros, if you reveive the payment at the same time?

4. Assume that the asset price S follows a log-normal distribution. The current asset price is $S_0 = 20$, and the volatility of the asset is $\sigma = 0.40$. The risk-free interest rate is $r = 0.05$.

a) Determine the *risk-neutral* probability that the asset price exceeds 21 euros at the end of a six-month period.

b) The conditional *risk-neutral* expected asset value at the end of the six-month period ($T = 0.5$), under a condition that the price exceeds 21 euros, equals to

$$E(S_T | S_T > 21) = 10.72.$$

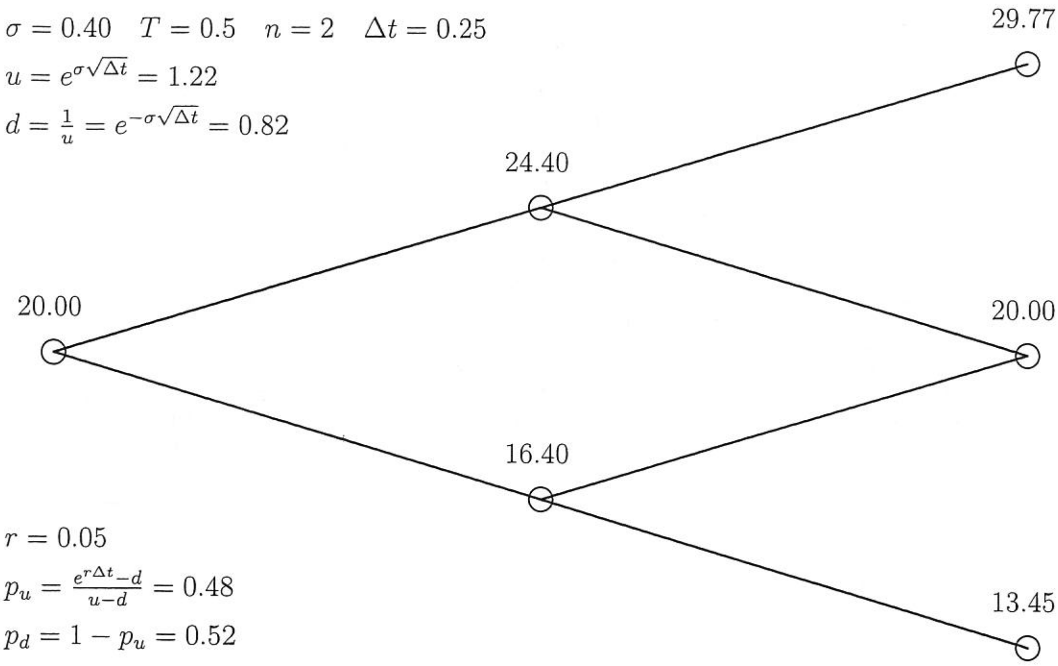
Determine the value of a six-month European call option on the asset, with the strike price of $K = 21$.

5. The following binomial tree represents the price process of a non-dividend-paying stock. Determine the approximate price of a six-month American put option on the stock. The strike price is $K = 21$.

$\sigma = 0.40 \quad T = 0.5 \quad n = 2 \quad \Delta t = 0.25$

$u = e^{\sigma\sqrt{\Delta t}} = 1.22$

$d = \frac{1}{u} = e^{-\sigma\sqrt{\Delta t}} = 0.82$



$r = 0.05$

$p_u = \frac{e^{r\Delta t} - d}{u - d} = 0.48$

$p_d = 1 - p_u = 0.52$

	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
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-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
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.	.	.	.	.	.	.	.	.	.	.

$$E_0(S_T) = S_0 e^{\mu T} \qquad Std_0(S_T) = S_0 e^{\mu T}\sqrt{e^{\sigma^2 T} - 1}$$

$$E_0(\ln S_T) = S_0 + (\mu - \frac{\sigma^2}{2})T \qquad Std_0(\ln S_T) = \sigma\sqrt{T}$$

$$F_{t,T} = S_t e^{r(T-t)} \qquad f_{t,T} = (F_{t,T} - K)e^{-r(T-t)} \qquad f_T = S_T - K$$

$$c_T = max(0, S_T - K) \qquad p_T = max(0, K - S_T)$$

$$c_t = S_t N\left[\frac{\ln(S_t/K) + (r + \frac{\sigma^2}{2})(T-t)}{\sigma\sqrt{T-t}}\right] - Ke^{-r(T-t)}N\left[\frac{\ln(S_t/K) + (r - \frac{\sigma^2}{2})(T-t)}{\sigma\sqrt{T-t}}\right]$$

$$p_t = Ke^{-r(T-t)}N\left[-\frac{\ln(S_t/K) + (r - \frac{\sigma^2}{2})(T-t)}{\sigma\sqrt{T-t}}\right] - S_t N\left[-\frac{\ln(S_t/K) + (r + \frac{\sigma^2}{2})(T-t)}{\sigma\sqrt{T-t}}\right]$$

$$P(\tilde{x} < X) = N\left[\frac{X - m}{s}\right]$$