FINANCIAL RISK MANAGEMENT

Jukka Perttunen

Name: ________________________________

Student number: ________________________________

All the answers on these sheets only!

1. The current asset price is $S_0 = 10.00$, the asset price volatility is $\sigma = 0.30$, the expected asset return is $\mu = 0.08$, 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 three-month period,

b) the probability that the asset price falls below 9 euros at the end of a three-month period.

2. The current asset price is $S_0 = 10.00$, the asset price volatility is $\sigma = 0.30$, the expected asset return is $\mu = 0.08$, and the risk-free interest rate is $r = 0.05$. Determine

a) the current three-month forward price of the asset.

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

c) the value of the contract above (b), after one month, when the asset price is 10.50, the expected asset return is 9%, and the risk-free two-month rate is 5.5%.

4. Consider a two-year swap, where the fixed-leg payer pays 3.035% swap rate annually and receives the six-month Euribor rate seminannually. The notional principal of the contract is 10 million euros. Calculate the expected periodic payments, and the present values of both the fixed-leg and the floating-leg payments of the contract.

Period	df	Forward rate		Swap rate	
	(1)	(2)	(3)	(4)	(5)
1	0.98654	2.699	182		
2	0.97144	3.058	183	3.035	360
3	0.95669	3.049	182		
4	0.94193	3.066	184	3.035	360

(1) The end-of-period discount factor

(2) The Euribor forward rate

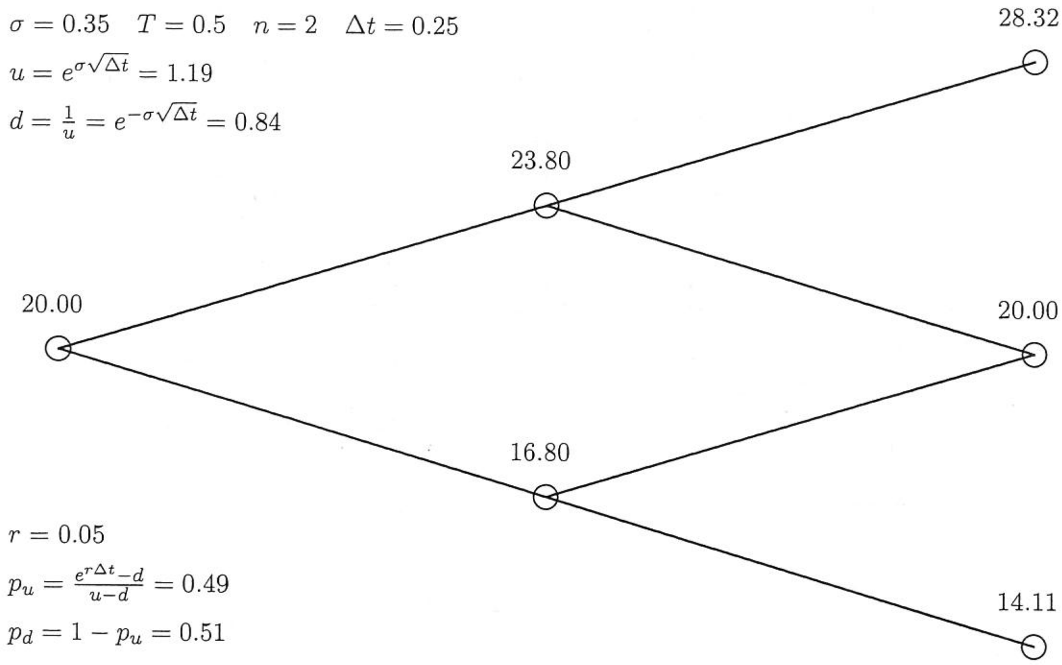
(3) The number of days in the forward rate period

(4) The swap rate

(5) The number of days in the swap rate period

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 $\sigma = 0.35$. The risk-free interest rate is $r = 0.05$. Determine the value of a six-month European put 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 $K = 21$.



	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
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.

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

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

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

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

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

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

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