

Université Libre de Bruxelles
Faculté SOCO
2006-2007

Final Exam

2nd session

Form A

Monday 13 August 2007

Indications

Please follow these indications:

1. The exam lasts 3 hours.
2. Please verify that your document contains exactly 8 pages.
3. Questions may have a weight different of 1 point each in some cases.
4. Please write your firstname and lastname on the first page.
5. Good work!!!

Problems

P1 Valuing opportunities...

Samarande is an alternative investment fund. As everyone in the market, finding undervalued investment opportunities is their desire. In the case of Samarande, however, this takes place under a specific reasoning. The managers of Samarande think that some projects are undervalued because their owners are unable to value correctly the total underlying value of their findings.

For example, recently, they had the following opportunity:

The firm Banister has discovered a new process that allows reducing substantially the gas particles of engines. The founder of Banister has a long previous experience in the automotive industry. Consequently, his business model is oriented to the development of this revolutionary technique for car engines.

The managers of Samarande think that this view of Banister is a little bit narrow-minded, eventhough the “car engine” business model seems to be very convincing given the projections provided here below (numbers in thousand EUR):

Thanks to the registration of a patent for the “car engine” business model, the following data is valid for the next 10 years (we assume that the “rent” is completely extracted by year 10 given the potential entry of competitors):

Estimation for year 1	Values
EBITDA	1'200
Depreciation	200
Change in Working Capital Requirement	50
Capex	Maintenance of the economic value

These numbers are expected to remain constant in real terms over the next 10 years.

First Name : _____ Last Name : _____

The development of the project and the cost of the patent for the “car engine sector” require an investment of 5'000'000 EUR at time 0.

Some additional data has been collected for the computation of the required return for Banister and for the valuation in general:

- Tax rate: 34%
- Riskfree rate: 5.25%
- Market risk premia: 5%
- Volatility of the cash-flows/assets in this kind of business: 35%
- Correlation between the returns of the MSCI World and the returns of comparable companies: 0.6.
- Volatility of market returns: 20%
- We assume that the inflation rate is at 2% per year.

We also assume that, given the risky character of this business, Banister and this kind of projects is fully financed by equity.

- Q1** Compute the annual cash-flow (constant in real terms). [1 point]
- Q2** Compute the expected return on equity (k_e) for this firm. [1 point]
- Q3** Compute the NPV of this project. [1 point]
- Q4** Compute the certainty equivalent of the yearly cash-flow obtained in Q1. How much is thus the price of risk (in EUR) per year (in real terms)?
Important: If you don't have any values in the past questions, please use the following data: NPV = 1'500'000 EUR. [1 point]

Banister is not considering investing in other applications for the moment since other areas require higher investments for the same expected cash flows & cash flow risk level (assumption made for the simplicity of the examination):

Area	Investment required
Aircraft industry	11.25 million EUR
Shipping industry	10 million EUR
Truck engines	8 million EUR

- Q5** How could Samarande justify a higher value than that presented by the original business model of Banister? Explain without calculations. [1 point]
- Q6** What is the maximum amount that Samarande is ready to pay for Banister? Provide the detailed calculations! [4 points]
- Q7** The maximum extra value (on top of that calculated by Banister) that Samarande is ready to pay depends mainly on the estimation of one of the parameters of the valuation process. So this value, is “at-estimation-risk”. Which one, in your opinion? Why? [1 point]

P2 Risky debt

Barracuda, a world travelling agency, has no debt. The number of shares outstanding is 1,000 and the price per share is €200.

Michael Whittaker, chief executive of Barracuda, is considering maybe increasing its level of debt, issuing a 5-year zero-coupon bond with a face value of €109'525. The proceeds of the issue are to be used to buy back shares. He asked the consulting firm McHardy to analyse this issue.

The following data is provided:

- Risk-free interest rate: 6%
- Beta asset: 0.80
- Market risk premium: 5%
- Target debt ratio (D/V): 40%
- The market return volatility is 18% (the MSCI World Index is used as a proxy)
- The correlation of Barracuda returns with the MSCI World Index is 0.6.

You are a consultant at McHardy and need to produce the report. At first sight, you think that the report should be based on the Merton model.

- Q8** What should be the market value of the bond issue? [1 point]
- Q9** What is the required yield for this debt issue? [1 point]
- Q10** What spread would Barracuda have to pay on its debt? [1 point]
- Q11** What would be impact of this level of debt on the beta and the expected return on equity? [1 point]
- Q12** By how much will the WACC of Barracuda change? [1 point]

P3 Firm Value, Debt and Tax shields

RFEverywhere (RFE) use “radio-frequency” technology for any kind of appliances: metro automatic cards, localisation of children or even your cat, etc... (see an interesting article of The Economist earlier this year). We have the following data for the year 2007 (in thousand EUR):

EBITDA	450
Depreciation	60
Change in Working Capital Requirement	12
Capex	100

RFE is expecting an annual growth of 6.25% of its EBITDA in 2008 and 2009. The other elements given above will remain unchanged. From 2010, the Free Cash Flows (unlevered) will grow at a rate of 1.5% per year (in perpetuity). The market value of the debt on the 31st December 2007 is 245'000 EUR.

The cost of debt is 7%. The debt is a perpetuity. The risk on assets of RFE (β) is 1.6. The current risk free rate is 5.5%. The expected return on the market portfolio is 10.5%. Corporate tax rate is equal to 34%.

- Q13** Compute the value of RFE, assuming that the amount of debt stays at 245'000. [1 point]

In order to finance the growth of the company, M. Bezel, CFO of RFE, realizes that he will have to borrow more. Then he decides to fix a leverage ratio (D/V) of 45% in 2009. After that, this ratio should remain constant.

- Q14** Compute the Capital Cash Flow (CCF) of the company. [1 point]
- Q15** What is the value of the company (use CCF)? [1 point]
- Q16** Compare how the following methods deal with tax shields : Adjusted Present Value (APV), Capital Cash Flow model (CCF model) and Free Cash Flow model (FCF model). [2 points]

N(x) & N(-x)=1-N(x)
 H. Pirotte - SBS/ULB - FinMetrics SA - Mai 2005

0.0	0.0000	0.5020	0.5040	0.5060	0.5080	0.5100	0.5120	0.5140	0.5160	0.5179	0.5199	0.5219	0.5239	0.5259	0.5279	0.5299	0.5319	0.5339	0.5359	0.5378
0.1	0.5398	0.5418	0.5438	0.5458	0.5478	0.5497	0.5517	0.5537	0.5557	0.5576	0.5596	0.5616	0.5636	0.5655	0.5675	0.5695	0.5714	0.5734	0.5753	0.5773
0.2	0.5793	0.5812	0.5832	0.5851	0.5871	0.5890	0.5910	0.5929	0.5948	0.5968	0.5987	0.6006	0.6026	0.6045	0.6064	0.6083	0.6103	0.6122	0.6141	0.6160
0.3	0.6179	0.6198	0.6217	0.6236	0.6255	0.6274	0.6293	0.6312	0.6331	0.6350	0.6369	0.6387	0.6406	0.6424	0.6443	0.6462	0.6480	0.6499	0.6517	0.6536
0.4	0.6554	0.6573	0.6591	0.6609	0.6628	0.6646	0.6664	0.6682	0.6700	0.6718	0.6736	0.6754	0.6772	0.6790	0.6808	0.6826	0.6844	0.6862	0.6879	0.6897
0.5	0.6915	0.6932	0.6950	0.6967	0.6985	0.7002	0.7019	0.7037	0.7054	0.7071	0.7088	0.7106	0.7123	0.7140	0.7157	0.7174	0.7190	0.7207	0.7224	0.7241
0.6	0.7257	0.7274	0.7291	0.7307	0.7324	0.7340	0.7357	0.7373	0.7389	0.7405	0.7422	0.7438	0.7454	0.7470	0.7486	0.7502	0.7517	0.7533	0.7549	0.7565
0.7	0.7580	0.7596	0.7611	0.7627	0.7642	0.7658	0.7673	0.7688	0.7704	0.7719	0.7734	0.7749	0.7764	0.7779	0.7794	0.7808	0.7823	0.7838	0.7852	0.7867
0.8	0.7881	0.7896	0.7910	0.7925	0.7939	0.7953	0.7967	0.7981	0.7995	0.8009	0.8023	0.8037	0.8051	0.8065	0.8078	0.8092	0.8106	0.8119	0.8133	0.8146
0.9	0.8159	0.8173	0.8186	0.8199	0.8212	0.8225	0.8238	0.8251	0.8264	0.8277	0.8289	0.8302	0.8315	0.8327	0.8340	0.8352	0.8365	0.8377	0.8389	0.8401
1.0	0.8413	0.8426	0.8438	0.8449	0.8461	0.8473	0.8485	0.8497	0.8508	0.8520	0.8531	0.8543	0.8554	0.8566	0.8577	0.8588	0.8599	0.8610	0.8621	0.8632
1.1	0.8643	0.8654	0.8665	0.8676	0.8686	0.8697	0.8708	0.8718	0.8729	0.8739	0.8749	0.8760	0.8770	0.8780	0.8790	0.8800	0.8810	0.8820	0.8830	0.8840
1.2	0.8849	0.8859	0.8869	0.8878	0.8888	0.8897	0.8907	0.8916	0.8925	0.8934	0.8944	0.8953	0.8962	0.8971	0.8980	0.8988	0.8997	0.9006	0.9015	0.9023
1.3	0.9032	0.9041	0.9049	0.9057	0.9066	0.9074	0.9082	0.9091	0.9099	0.9107	0.9115	0.9123	0.9131	0.9139	0.9147	0.9154	0.9162	0.9170	0.9177	0.9185
1.4	0.9192	0.9200	0.9207	0.9215	0.9222	0.9229	0.9236	0.9244	0.9251	0.9258	0.9265	0.9272	0.9279	0.9285	0.9292	0.9299	0.9306	0.9312	0.9319	0.9325
1.5	0.9332	0.9338	0.9345	0.9351	0.9357	0.9364	0.9370	0.9376	0.9382	0.9388	0.9394	0.9400	0.9406	0.9412	0.9418	0.9424	0.9429	0.9435	0.9441	0.9446
1.6	0.9452	0.9458	0.9463	0.9468	0.9474	0.9479	0.9484	0.9490	0.9495	0.9500	0.9505	0.9510	0.9515	0.9520	0.9525	0.9530	0.9535	0.9540	0.9545	0.9550
1.7	0.9554	0.9559	0.9564	0.9568	0.9573	0.9577	0.9582	0.9586	0.9591	0.9595	0.9599	0.9604	0.9608	0.9612	0.9616	0.9621	0.9625	0.9629	0.9633	0.9637
1.8	0.9641	0.9645	0.9649	0.9652	0.9656	0.9660	0.9664	0.9667	0.9671	0.9675	0.9678	0.9682	0.9686	0.9689	0.9693	0.9696	0.9699	0.9703	0.9706	0.9710
1.9	0.9713	0.9716	0.9719	0.9723	0.9726	0.9729	0.9732	0.9735	0.9738	0.9741	0.9744	0.9747	0.9750	0.9753	0.9756	0.9759	0.9761	0.9764	0.9767	0.9770
2.0	0.9772	0.9775	0.9778	0.9780	0.9783	0.9786	0.9788	0.9791	0.9793	0.9796	0.9798	0.9801	0.9803	0.9805	0.9808	0.9810	0.9812	0.9815	0.9817	0.9819
2.1	0.9821	0.9824	0.9826	0.9828	0.9830	0.9832	0.9834	0.9836	0.9838	0.9840	0.9842	0.9844	0.9846	0.9848	0.9850	0.9852	0.9854	0.9856	0.9857	0.9859
2.2	0.9861	0.9863	0.9864	0.9866	0.9868	0.9870	0.9871	0.9873	0.9875	0.9876	0.9878	0.9879	0.9881	0.9882	0.9884	0.9885	0.9887	0.9888	0.9890	0.9891
2.3	0.9893	0.9894	0.9896	0.9897	0.9898	0.9900	0.9901	0.9902	0.9904	0.9905	0.9906	0.9907	0.9909	0.9910	0.9911	0.9912	0.9913	0.9915	0.9916	0.9917
2.4	0.9919	0.9920	0.9921	0.9922	0.9923	0.9924	0.9925	0.9926	0.9927	0.9928	0.9929	0.9930	0.9931	0.9932	0.9933	0.9933	0.9934	0.9935	0.9936	0.9937
2.5	0.9938	0.9939	0.9940	0.9941	0.9942	0.9943	0.9944	0.9945	0.9945	0.9946	0.9947	0.9948	0.9948	0.9948	0.9949	0.9950	0.9951	0.9952	0.9953	0.9953
2.6	0.9954	0.9955	0.9956	0.9957	0.9957	0.9957	0.9957	0.9958	0.9959	0.9959	0.9960	0.9960	0.9961	0.9962	0.9962	0.9963	0.9964	0.9964	0.9965	0.9965
2.7	0.9965	0.9966	0.9967	0.9967	0.9968	0.9968	0.9968	0.9969	0.9969	0.9970	0.9970	0.9971	0.9971	0.9972	0.9972	0.9972	0.9973	0.9973	0.9974	0.9974
2.8	0.9974	0.9975	0.9975	0.9976	0.9976	0.9976	0.9977	0.9977	0.9977	0.9978	0.9978	0.9978	0.9979	0.9979	0.9979	0.9980	0.9980	0.9981	0.9981	0.9981
2.9	0.9981	0.9982	0.9982	0.9982	0.9982	0.9983	0.9983	0.9983	0.9984	0.9984	0.9984	0.9984	0.9985	0.9985	0.9985	0.9986	0.9986	0.9986	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9987	0.9987	0.9988	0.9988	0.9988	0.9988	0.9988	0.9989	0.9989	0.9989	0.9989	0.9989	0.9989	0.9990	0.9990	0.9990	0.9990
3.1	0.9990	0.9990	0.9991	0.9991	0.9991	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993	0.9993	0.9993	0.9993	0.9993
3.2	0.9993	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998	0.9998	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9998	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Call Prices with Black & Scholes Option Pricing

Price of a B&Sch call option where result=C/S

Cumulative Volatility: Sigma*SQRT(T)	Moneyness: $\frac{S e^{-qT}}{K e^{-rT}}$																								
	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.15	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	
0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.76%	9.09%	13.04%	16.67%	20.00%	23.08%	25.93%	28.57%	31.03%	33.33%	35.48%
0.05	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.41%	1.99%	5.19%	9.14%	13.05%	16.67%	20.00%	23.08%	25.93%	28.57%	31.03%	33.33%	35.48%	
0.10	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.05%	0.24%	0.79%	1.99%	3.99%	6.73%	9.96%	13.39%	16.79%	20.04%	23.09%	25.93%	28.57%	31.03%	33.33%	35.48%	
0.15	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.05%	0.18%	0.50%	1.15%	2.25%	3.86%	5.98%	8.52%	11.36%	14.37%	17.41%	20.40%	23.29%	26.04%	28.63%	31.06%	33.35%	35.49%	
0.20	0.00%	0.00%	0.00%	0.01%	0.04%	0.14%	0.35%	0.77%	1.48%	2.54%	3.99%	5.81%	7.97%	10.39%	12.99%	15.71%	18.46%	21.19%	23.85%	26.43%	28.89%	31.24%	33.46%	35.56%	
0.25	0.00%	0.01%	0.03%	0.09%	0.24%	0.53%	1.03%	1.78%	2.83%	4.19%	5.86%	7.79%	9.95%	12.28%	14.72%	17.23%	19.75%	22.27%	24.73%	27.13%	29.44%	31.66%	33.78%	35.80%	
0.30	0.01%	0.05%	0.15%	0.35%	0.70%	1.25%	2.04%	3.10%	4.42%	5.99%	7.79%	9.78%	11.92%	14.17%	16.49%	18.84%	21.20%	23.53%	25.83%	28.06%	30.23%	32.32%	34.32%	36.25%	
0.35	0.08%	0.20%	0.44%	0.84%	1.44%	2.26%	3.33%	4.63%	6.15%	7.87%	9.76%	11.78%	13.89%	16.07%	18.29%	20.52%	22.73%	24.92%	27.07%	29.16%	31.20%	33.16%	35.06%	36.88%	
0.40	0.23%	0.50%	0.94%	1.58%	2.43%	3.52%	4.82%	6.31%	7.99%	9.81%	11.75%	13.77%	15.85%	17.97%	20.10%	22.22%	24.32%	26.39%	28.42%	30.39%	32.30%	34.16%	35.95%	37.68%	
0.45	0.54%	1.00%	1.67%	2.55%	3.66%	4.96%	6.45%	8.10%	9.89%	11.77%	13.74%	15.76%	17.80%	19.86%	21.91%	23.94%	25.95%	27.91%	29.83%	31.69%	33.51%	35.26%	36.96%	38.60%	
0.50	1.01%	1.70%	2.61%	3.74%	5.06%	6.55%	8.20%	9.97%	11.83%	13.76%	15.73%	17.73%	19.74%	21.74%	23.72%	25.68%	27.59%	29.46%	31.29%	33.06%	34.78%	36.45%	38.06%	39.61%	
0.55	1.68%	2.61%	3.75%	5.09%	6.61%	8.26%	10.03%	11.88%	13.80%	15.75%	17.72%	19.70%	21.67%	23.61%	25.53%	27.41%	29.25%	31.04%	32.78%	34.47%	36.11%	37.69%	39.23%	40.71%	
0.60	2.53%	3.69%	5.06%	6.60%	8.27%	10.05%	11.91%	13.83%	15.78%	17.75%	19.71%	21.66%	23.58%	25.48%	27.33%	29.14%	30.91%	32.62%	34.29%	35.91%	37.47%	38.98%	40.44%	41.86%	
0.65	3.55%	4.95%	6.51%	8.22%	10.03%	11.91%	13.84%	15.80%	17.77%	19.74%	21.68%	23.60%	25.48%	27.32%	29.12%	30.87%	32.57%	34.22%	35.82%	37.36%	38.86%	40.30%	41.70%	43.05%	
0.70	4.74%	6.34%	8.08%	9.93%	11.85%	13.82%	15.80%	17.79%	19.77%	21.72%	23.64%	25.53%	27.37%	29.16%	30.90%	32.59%	34.23%	35.81%	37.35%	38.83%	40.26%	41.65%	42.98%	44.27%	
0.75	6.07%	7.86%	9.76%	11.72%	13.73%	15.76%	17.78%	19.78%	21.76%	23.70%	25.59%	27.44%	29.23%	30.98%	32.67%	34.30%	35.88%	37.41%	38.88%	40.31%	41.68%	43.01%	44.29%	45.52%	
0.80	7.52%	9.48%	11.51%	13.58%	15.65%	17.72%	19.77%	21.78%	23.74%	25.66%	27.52%	29.33%	31.08%	32.78%	34.42%	36.00%	37.52%	39.00%	40.42%	41.78%	43.11%	44.38%	45.61%	46.79%	
0.85	9.08%	11.19%	13.33%	15.48%	17.61%	19.71%	21.76%	23.77%	25.72%	27.61%	29.44%	31.21%	32.92%	34.56%	36.15%	37.68%	39.16%	40.58%	41.94%	43.26%	44.53%	45.75%	46.93%	48.07%	
0.90	10.74%	12.97%	15.20%	17.41%	19.58%	21.70%	23.76%	25.75%	27.68%	29.54%	31.34%	33.07%	34.73%	36.33%	37.87%	39.35%	40.77%	42.14%	43.46%	44.73%	45.95%	47.13%	48.26%	49.35%	
0.95	12.47%	14.81%	17.12%	19.37%	21.57%	23.69%	25.75%	27.72%	29.63%	31.46%	33.21%	34.90%	36.52%	38.08%	39.57%	41.00%	42.38%	43.70%	44.97%	46.19%	47.37%	48.50%	49.59%	50.64%	
1.00	14.27%	16.70%	19.06%	21.35%	23.56%	25.68%	27.73%	29.68%	31.56%	33.35%	35.07%	36.72%	38.29%	39.80%	41.25%	42.64%	43.97%	45.24%	46.47%	47.65%	48.78%	49.87%	50.92%	51.92%	
1.05	16.13%	18.62%	21.03%	23.34%	25.55%	27.67%	29.69%	31.62%	33.47%	35.22%	36.90%	38.51%	40.04%	41.51%	42.91%	44.25%	45.54%	46.77%	47.96%	49.09%	50.18%	51.23%	52.24%	53.21%	
1.10	18.03%	20.58%	23.01%	25.33%	27.54%	29.65%	31.65%	33.55%	35.35%	37.08%	38.72%	40.28%	41.77%	43.19%	44.55%	45.85%	47.09%	48.28%	49.43%	50.52%	51.57%	52.58%	53.55%	54.48%	
1.15	19.96%	22.55%	25.00%	27.33%	29.53%	31.61%	33.58%	35.45%	37.22%	38.90%	40.50%	42.02%	43.47%	44.85%	46.17%	47.43%	48.63%	49.78%	50.88%	51.93%	52.95%	53.92%	54.85%	55.75%	
1.20	21.92%	24.53%	27.00%	29.32%	31.50%	33.56%	35.50%	37.33%	39.06%	40.71%	42.26%	43.74%	45.15%	46.49%	47.76%	48.98%	50.14%	51.25%	52.31%	53.33%	54.31%	55.24%	56.14%	57.01%	
1.25	23.89%	26.53%	28.99%	31.30%	33.46%	35.48%	37.39%	39.19%	40.88%	42.48%	44.00%	45.44%	46.80%	48.10%	49.33%	50.51%	51.63%	52.71%	53.73%	54.71%	55.65%	56.56%	57.42%	58.25%	
1.30	25.88%	28.52%	30.98%	33.26%	35.40%	37.39%	39.26%	41.02%	42.68%	44.24%	45.71%	47.11%	48.43%	49.69%	50.88%	52.02%	53.10%	54.14%	55.13%	56.08%	56.98%	57.85%	58.69%	59.49%	
1.35	27.87%	30.51%	32.95%	35.21%	37.31%	39.28%	41.11%	42.83%	44.44%	45.96%	47.39%	48.75%	50.03%	51.25%	52.41%	53.51%	54.55%	55.55%	56.51%	57.42%	58.29%	59.13%	59.93%	60.70%	
1.40	29.87%	32.50%	34.91%	37.14%	39.21%	41.14%	42.93%	44.61%	46.18%	47.66%	49.05%	50.36%	51.61%	52.79%	53.90%	54.97%	55.98%	56.94%	57.86%	58.74%	59.58%	60.39%	61.16%	61.91%	
1.45	31.86%	34.47%	36.86%	39.06%	41.09%	42.97%	44.72%	46.36%	47.89%	49.32%	50.68%	51.95%	53.15%	54.29%	55.38%	56.40%	57.38%	58.31%	59.20%	60.05%	60.86%	61.63%	62.38%	63.09%	
1.50	33.84%	36.42%	38.78%	40.94%	42.93%	44.78%	46.49%	48.08%	49.57%	50.96%	52.27%	53.51%	54.67%	55.78%	56.82%	57.81%	58.76%	59.65%	60.51%	61.33%	62.11%	62.86%	63.57%	64.26%	
1.55	35.81%	38.36%	40.68%	42.81%	44.75%	46.55%	48.22%	49.77%	51.22%	52.57%	53.84%	55.04%	56.17%	57.23%	58.24%	59.20%	60.11%	60.97%	61.80%	62.59%	63.34%	64.06%	64.75%	65.41%	
1.60	37.76%	40.28%	42.56%	44.64%	46.55%	48.30%	49.92%	51.43%	52.84%	54.15%	55.38%	56.54%	57.63%	58.66%	59.63%	60.56%	61.43%	62.27%	63.06%	63.82%	64.55%	65.24%	65.90%	66.54%	
1.65	39.69%	42.17%	44.41%	46.45%	48.31%	50.02%	51.60%	53.06%	54.42%	55.70%	56.89%	58.01%	59.06%	60.06%	61.00%	61.89%	62.74%	63.54%	64.31%	65.04%	65.73%	66.40%	67.04%	67.65%	
1.70	41.61%	44.04%	46.24%	48.22%	50.04%	51.70%	53.24%	54.66%	55.98%	57.21%	58.37%	59.45%	60.47%	61.43%	62.34%	63.19%	64.01%	64.78%	65.52%	66.23%	66.90%	67.54%	68.15%	68.74%	
1.75	43.49%	45.88%	48.03%	49.97%	51.74%	53.36%	54.85%	56.23%	57.51%	58.70%	59.81%	60.86%	61.84%	62.77%	63.64%	64.47%	65.26%	66.00%	66.71%	67.39%	68.04%	68.65%	69.24%	69.81%	
1.80	45.36%	47.70%	49.79%	51.68%	53.40%	54.98%	56.42%	57.76%	59.00%	60.15%	61.23%	62.24%	63.19%	64.08%	64.93%	65.72%	66.48%	67.20%	67.88%	68.53%	69.15%	69.75%	70.31%	70.86%	
1.85	47.19%	49.48%	51.52%	53.37%	55.04%	56.56%	57.97%	59.26%	60.46%	61.57%	62.61%	63.59%	64.50%	65.36%	66.18%	66.95%	67.67%	68.37%	69.02%	69.65%	70.25%	70.82%	71.36%	71.88%	
1.90	48.99%	51.23%	53.22%	55.01%	56.64%	58.12%	59.47%	60.73%	61.88%	62.96%	63.97%	64.91%	65.79%	66.62%	67.40%	68.14%	68.84%	69.51%	70.14%	70.74%	71.32%	71.86%	72.39%	72.89%	
1.95	50.76%	52.95%	54.89%	56.63%	58.20%	59.63%	60.95%	62.16%	63.28%	64.32%	65.29%	66.19%	67.04%	67.84%	68.60%	69.31%	69.98%	70.62%	71.23%	71.81%	72.36%	72.89%	73.39%	73.87%	
2.00	52.50%	54.63%	56.51%	58.20%	59.73%	61.12%	62.39%	63.56%	64.64%	65.64%	66.58%	67.45%	68.27%	69.04%	69.76%	70.45%	71.10%	71.71%	72.30%	72.85%	73.38%	73.89%	74.37%	74.83%	

Call Prices with Black & Scholes Option Pricing

Price of a B&Sch call option where result=C/S

Cumulative Volatility: Sigma*SQRT(T)	Moneyness: $\frac{S e^{-qT}}{K e^{-rT}}$																							
	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75
0.00	37.50%	39.39%	41.18%	42.86%	44.44%	45.95%	47.37%	48.72%	50.00%	51.22%	52.38%	53.49%	54.55%	55.56%	56.52%	57.45%	58.33%	59.18%	60.00%	60.78%	61.54%	62.26%	62.96%	63.64%
0.05	37.50%	39.39%	41.18%	42.86%	44.44%	45.95%	47.37%	48.72%	50.00%	51.22%	52.38%	53.49%	54.55%	55.56%	56.52%	57.45%	58.33%	59.18%	60.00%	60.78%	61.54%	62.26%	62.96%	63.64%
0.10	37.50%	39.39%	41.18%	42.86%	44.44%	45.95%	47.37%	48.72%	50.00%	51.22%	52.38%	53.49%	54.55%	55.56%	56.52%	57.45%	58.33%	59.18%	60.00%	60.78%	61.54%	62.26%	62.96%	63.64%
0.15	37.50%	39.40%	41.18%	42.86%	44.44%	45.95%	47.37%	48.72%	50.00%	51.22%	52.38%	53.49%	54.55%	55.56%	56.52%	57.45%	58.33%	59.18%	60.00%	60.78%	61.54%	62.26%	62.96%	63.64%
0.20	37.55%	39.42%	41.20%	42.87%	44.45%	45.95%	47.37%	48.72%	50.00%	51.22%	52.38%	53.49%	54.55%	55.56%	56.52%	57.45%	58.33%	59.18%	60.00%	60.78%	61.54%	62.26%	62.96%	63.64%
0.25	37.73%	39.56%	41.29%	42.94%	44.50%	45.99%	47.40%	48.74%	50.01%	51.23%	52.39%	53.49%	54.55%	55.56%	56.52%	57.45%	58.33%	59.18%	60.00%	60.78%	61.54%	62.26%	62.96%	63.64%
0.30	38.09%	39.85%	41.53%	43.13%	44.65%	46.11%	47.49%	48.81%	50.07%	51.28%	52.43%	53.52%	54.57%	55.58%	56.54%	57.46%	58.34%	59.19%	60.01%	60.79%	61.54%	62.27%	62.97%	63.64%
0.35	38.64%	40.32%	41.93%	43.47%	44.94%	46.35%	47.70%	48.99%	50.22%	51.40%	52.53%	53.61%	54.64%	55.64%	56.59%	57.50%	58.38%	59.22%	60.03%	60.81%	61.56%	62.28%	62.98%	63.65%
0.40	39.34%	40.94%	42.48%	43.95%	45.37%	46.72%	48.03%	49.27%	50.47%	51.62%	52.72%	53.77%	54.79%	55.76%	56.70%	57.60%	58.46%	59.29%	60.09%	60.86%	61.61%	62.32%	63.01%	63.68%
0.45	40.18%	41.70%	43.16%	44.57%	45.93%	47.23%	48.48%	49.68%	50.83%	51.94%	53.01%	54.04%	55.02%	55.97%	56.89%	57.77%	58.61%	59.43%	60.21%	60.97%	61.70%	62.41%	63.09%	63.75%
0.50	41.12%	42.56%	43.96%	45.30%	46.60%	47.84%	49.04%	50.20%	51.31%	52.38%	53.41%	54.40%	55.35%	56.27%	57.16%	58.02%	58.84%	59.64%	60.41%	61.15%	61.86%	62.56%	63.22%	63.87%
0.55	42.14%	43.52%	44.85%	46.13%	47.36%	48.55%	49.70%	50.81%	51.88%	52.90%	53.90%	54.85%	55.77%	56.66%	57.52%	58.35%	59.15%	59.92%	60.67%	61.39%	62.09%	62.77%	63.42%	64.05%
0.60	43.22%	44.53%	45.80%	47.03%	48.21%	49.35%	50.45%	51.51%	52.53%	53.52%	54.47%	55.39%	56.28%	57.14%	57.96%	58.76%	59.54%	60.29%	61.01%	61.71%	62.39%	63.05%	63.68%	64.30%
0.65	44.35%	45.61%	46.82%	47.99%	49.12%	50.21%	51.26%	52.28%	53.26%	54.20%	55.12%	56.00%	56.86%	57.68%	58.48%	59.25%	60.00%	60.72%	61.42%	62.10%	62.76%	63.39%	64.01%	64.61%
0.70	45.52%	46.72%	47.88%	49.00%	50.08%	51.12%	52.13%	53.10%	54.04%	54.95%	55.83%	56.68%	57.50%	58.29%	59.06%	59.80%	60.52%	61.22%	61.90%	62.55%	63.18%	63.80%	64.40%	64.98%
0.75	46.72%	47.87%	48.98%	50.05%	51.08%	52.08%	53.04%	53.98%	54.88%	55.75%	56.59%	57.41%	58.19%	58.96%	59.70%	60.41%	61.10%	61.78%	62.43%	63.06%	63.67%	64.26%	64.84%	65.40%
0.80	47.93%	49.03%	50.10%	51.12%	52.12%	53.07%	54.00%	54.89%	55.75%	56.59%	57.40%	58.18%	58.94%	59.67%	60.38%	61.07%	61.73%	62.38%	63.01%	63.62%	64.21%	64.78%	65.34%	65.88%
0.85	49.16%	50.22%	51.24%	52.22%	53.17%	54.09%	54.98%	55.84%	56.66%	57.47%	58.24%	58.99%	59.72%	60.42%	61.11%	61.77%	62.41%	63.03%	63.63%	64.22%	64.79%	65.34%	65.88%	66.40%
0.90	50.40%	51.42%	52.40%	53.34%	54.25%	55.13%	55.98%	56.81%	57.60%	58.37%	59.11%	59.84%	60.53%	61.21%	61.86%	62.50%	63.12%	63.71%	64.30%	64.86%	65.41%	65.94%	66.46%	66.96%
0.95	51.65%	52.62%	53.56%	54.47%	55.34%	56.19%	57.01%	57.79%	58.56%	59.30%	60.01%	60.70%	61.37%	62.02%	62.65%	63.26%	63.86%	64.43%	64.99%	65.53%	66.06%	66.57%	67.07%	67.55%
1.00	52.90%	53.83%	54.73%	55.60%	56.44%	57.26%	58.04%	58.80%	59.53%	60.24%	60.93%	61.59%	62.23%	62.86%	63.46%	64.05%	64.62%	65.17%	65.71%	66.23%	66.74%	67.23%	67.71%	68.18%
1.05	54.14%	55.04%	55.91%	56.74%	57.55%	58.33%	59.08%	59.81%	60.51%	61.20%	61.85%	62.49%	63.11%	63.71%	64.29%	64.86%	65.40%	65.93%	66.45%	66.95%	67.44%	67.91%	68.38%	68.82%
1.10	55.38%	56.25%	57.08%	57.88%	58.66%	59.41%	60.13%	60.83%	61.51%	62.16%	62.79%	63.41%	64.00%	64.58%	65.14%	65.68%	66.20%	66.71%	67.21%	67.69%	68.16%	68.62%	69.06%	69.49%
1.15	56.61%	57.45%	58.25%	59.02%	59.77%	60.49%	61.18%	61.85%	62.50%	63.13%	63.74%	64.33%	64.90%	65.45%	65.99%	66.51%	67.02%	67.51%	67.98%	68.45%	68.90%	69.34%	69.76%	70.18%
1.20	57.84%	58.64%	59.41%	60.15%	60.87%	61.56%	62.23%	62.87%	63.50%	64.10%	64.69%	65.25%	65.80%	66.33%	66.85%	67.35%	67.84%	68.31%	68.77%	69.21%	69.65%	70.07%	70.48%	70.88%
1.25	59.05%	59.82%	60.56%	61.28%	61.97%	62.63%	63.27%	63.90%	64.50%	65.08%	65.64%	66.18%	66.71%	67.22%	67.71%	68.20%	68.66%	69.12%	69.56%	69.99%	70.40%	70.81%	71.20%	71.59%
1.30	60.26%	61.00%	61.71%	62.40%	63.06%	63.70%	64.32%	64.91%	65.49%	66.05%	66.59%	67.11%	67.61%	68.11%	68.58%	69.04%	69.49%	69.93%	70.35%	70.76%	71.16%	71.55%	71.93%	72.30%
1.35	61.44%	62.16%	62.84%	63.50%	64.14%	64.76%	65.35%	65.92%	66.48%	67.01%	67.53%	68.03%	68.52%	68.99%	69.45%	69.89%	70.32%	70.74%	71.15%	71.54%	71.93%	72.30%	72.67%	73.02%
1.40	62.62%	63.30%	63.96%	64.60%	65.21%	65.80%	66.37%	66.92%	67.46%	67.97%	68.47%	68.95%	69.42%	69.87%	70.31%	70.74%	71.15%	71.56%	71.95%	72.33%	72.70%	73.06%	73.41%	73.75%
1.45	63.78%	64.44%	65.07%	65.68%	66.27%	66.84%	67.39%	67.92%	68.43%	68.92%	69.40%	69.87%	70.32%	70.75%	71.17%	71.58%	71.98%	72.37%	72.74%	73.11%	73.46%	73.81%	74.15%	74.47%
1.50	64.92%	65.55%	66.16%	66.75%	67.32%	67.86%	68.39%	68.90%	69.39%	69.87%	70.33%	70.77%	71.20%	71.62%	72.03%	72.42%	72.80%	73.17%	73.54%	73.89%	74.23%	74.56%	74.88%	75.20%
1.55	66.04%	66.65%	67.24%	67.81%	68.35%	68.87%	69.38%	69.87%	70.34%	70.80%	71.24%	71.67%	72.08%	72.48%	72.87%	73.25%	73.62%	73.98%	74.32%	74.66%	74.99%	75.31%	75.62%	75.92%
1.60	67.15%	67.74%	68.30%	68.84%	69.37%	69.87%	70.36%	70.83%	71.28%	71.72%	72.14%	72.55%	72.95%	73.34%	73.71%	74.08%	74.43%	74.77%	75.10%	75.43%	75.74%	76.05%	76.35%	76.64%
1.65	68.24%	68.80%	69.34%	69.87%	70.37%	70.85%	71.32%	71.77%	72.21%	72.63%	73.04%	73.43%	73.81%	74.18%	74.54%	74.89%	75.23%	75.56%	75.88%	76.19%	76.49%	76.78%	77.07%	77.35%
1.70	69.31%	69.85%	70.37%	70.87%	71.35%	71.82%	72.27%	72.70%	73.12%	73.52%	73.91%	74.29%	74.66%	75.02%	75.36%	75.70%	76.02%	76.34%	76.64%	76.94%	77.23%	77.51%	77.79%	78.05%
1.75	70.35%	70.87%	71.37%	71.86%	72.32%	72.77%	73.20%	73.61%	74.02%	74.40%	74.78%	75.14%	75.50%	75.84%	76.17%	76.49%	76.80%	77.10%	77.40%	77.68%	77.96%	78.23%	78.50%	78.75%
1.80	71.38%	71.88%	72.36%	72.82%	73.27%	73.70%	74.11%	74.51%	74.90%	75.27%	75.63%	75.98%	76.32%	76.64%	76.96%	77.27%	77.57%	77.86%	78.14%	78.42%	78.68%	78.94%	79.20%	79.44%
1.85	72.39%	72.87%	73.33%	73.77%	74.20%	74.61%	75.01%	75.39%	75.76%	76.12%	76.47%	76.80%	77.12%	77.44%	77.74%	78.04%	78.33%	78.60%	78.88%	79.14%	79.40%	79.64%	79.89%	80.12%
1.90	73.37%	73.83%	74.28%	74.70%	75.11%	75.51%	75.89%	76.26%	76.61%	76.95%	77.29%	77.61%	77.92%	78.22%	78.51%	78.80%	79.07%	79.34%	79.60%	79.85%	80.10%	80.33%	80.57%	80.79%
1.95	74.33%	74.78%	75.20%	75.61%	76.00%	76.38%	76.75%	77.10%	77.44%	77.77%	78.09%	78.40%	78.70%	78.99%	79.27%	79.54%	79.80%	80.06%	80.31%	80.55%	80.78%	81.01%	81.24%	81.45%
2.00	75.27%	75.70%	76.11%	76.50%	76.88%	77.24%	77.59%	77.93%	78.26%	78.57%	78.88%	79.17%	79.46%	79.74%	80.00%	80.26%	80.52%	80.76%	81.00%	81.23%	81.46%	81.68%	81.89%	82.10%

Put Prices with Black & Scholes Option Pricing

H. Pirotte - SBS/ULB - FinMetrics SA - Juin 2006

Price of a B&Sch call option where result=P/S

Cumulative Volatili Sigma*SQRT(T)	Moneyness: Se^{-qt} / Ke^{-rt}																							
	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.15	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55
0.00	150.00%	122.22%	100.00%	81.82%	66.67%	53.85%	42.86%	33.33%	25.00%	17.65%	11.11%	5.26%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.05	150.00%	122.22%	100.00%	81.82%	66.67%	53.85%	42.86%	33.33%	25.00%	17.65%	11.14%	5.27%	1.99%	0.43%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.10	150.00%	122.22%	100.00%	81.82%	66.67%	53.85%	42.86%	33.34%	25.05%	17.88%	11.90%	7.25%	3.99%	1.97%	0.87%	0.34%	0.12%	0.04%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
0.15	150.00%	122.22%	100.00%	81.82%	66.67%	53.86%	42.91%	33.52%	25.50%	18.80%	13.36%	9.12%	5.98%	3.76%	2.27%	1.32%	0.74%	0.40%	0.21%	0.11%	0.05%	0.03%	0.01%	0.01%
0.20	150.00%	122.22%	100.00%	81.83%	66.71%	53.98%	43.21%	34.11%	26.48%	20.19%	15.10%	11.07%	7.97%	5.62%	3.90%	2.66%	1.79%	1.19%	0.78%	0.50%	0.32%	0.20%	0.13%	0.08%
0.25	150.00%	122.23%	100.03%	81.91%	66.91%	54.38%	43.88%	35.11%	27.83%	21.84%	16.97%	13.05%	9.95%	7.51%	5.63%	4.18%	3.09%	2.27%	1.65%	1.20%	0.87%	0.62%	0.45%	0.32%
0.30	150.01%	122.28%	100.15%	82.17%	67.36%	55.10%	44.90%	36.43%	29.42%	23.64%	18.90%	15.05%	11.92%	9.41%	7.40%	5.80%	4.53%	3.53%	2.75%	2.13%	1.65%	1.28%	0.99%	0.77%
0.35	150.08%	122.42%	100.44%	82.65%	68.10%	56.11%	46.19%	37.96%	31.15%	25.52%	20.87%	17.04%	13.89%	11.31%	9.20%	7.47%	6.07%	4.92%	3.99%	3.24%	2.63%	2.13%	1.73%	1.40%
0.40	150.23%	122.73%	100.94%	83.40%	69.10%	57.36%	47.67%	39.65%	32.99%	27.46%	22.86%	19.03%	15.85%	13.21%	11.01%	9.18%	7.66%	6.39%	5.34%	4.46%	3.73%	3.12%	2.62%	2.19%
0.45	150.54%	123.22%	101.67%	84.37%	70.32%	58.81%	49.31%	41.44%	34.89%	29.42%	24.85%	21.02%	17.80%	15.10%	12.82%	10.90%	9.28%	7.91%	6.75%	5.77%	4.94%	4.23%	3.63%	3.11%
0.50	151.01%	123.93%	102.61%	85.55%	71.72%	60.40%	51.06%	43.30%	36.83%	31.41%	26.84%	23.00%	19.74%	16.98%	14.63%	12.63%	10.92%	9.46%	8.21%	7.14%	6.21%	5.41%	4.73%	4.13%
0.55	151.68%	124.83%	103.75%	86.91%	73.27%	62.11%	52.89%	45.22%	38.80%	33.40%	28.84%	24.96%	21.67%	18.85%	16.44%	14.37%	12.58%	11.04%	9.70%	8.54%	7.54%	6.66%	5.89%	5.22%
0.60	152.53%	125.92%	105.06%	88.41%	74.94%	63.90%	54.77%	47.16%	40.78%	35.39%	30.82%	26.92%	23.58%	20.71%	18.24%	16.10%	14.24%	12.62%	11.21%	9.98%	8.90%	7.95%	7.11%	6.37%
0.65	153.55%	127.17%	106.51%	90.03%	76.69%	65.76%	56.70%	49.14%	42.77%	37.38%	32.79%	28.86%	25.48%	22.56%	20.03%	17.83%	15.90%	14.22%	12.74%	11.44%	10.29%	9.27%	8.37%	7.56%
0.70	154.74%	128.56%	108.08%	91.75%	78.52%	67.66%	58.66%	51.12%	44.77%	39.37%	34.76%	30.79%	27.37%	24.40%	21.81%	19.55%	17.56%	15.81%	14.27%	12.91%	11.69%	10.61%	9.65%	8.79%
0.75	156.07%	130.08%	109.76%	93.54%	80.40%	69.60%	60.64%	53.12%	46.76%	41.34%	36.70%	32.70%	29.23%	26.21%	23.57%	21.26%	19.21%	17.41%	15.81%	14.38%	13.11%	11.97%	10.96%	10.04%
0.80	157.52%	131.70%	111.51%	95.39%	82.32%	71.57%	62.63%	55.11%	48.74%	43.31%	38.64%	34.60%	31.08%	28.02%	25.33%	22.95%	20.86%	19.00%	17.34%	15.86%	14.53%	13.34%	12.27%	11.31%
0.85	159.08%	133.41%	113.33%	97.29%	84.27%	73.55%	64.62%	57.10%	50.72%	45.26%	40.55%	36.47%	32.92%	29.80%	27.06%	24.64%	22.49%	20.58%	18.87%	17.33%	15.96%	14.72%	13.60%	12.58%
0.90	160.74%	135.19%	115.20%	99.23%	86.25%	75.54%	66.61%	59.09%	52.68%	47.19%	42.45%	38.33%	34.73%	31.57%	28.78%	26.31%	24.11%	22.14%	20.39%	18.81%	17.38%	16.09%	14.93%	13.87%
0.95	162.47%	137.03%	117.12%	101.19%	88.23%	77.54%	68.60%	61.06%	54.63%	49.10%	44.33%	40.16%	36.52%	33.31%	30.48%	27.96%	25.71%	23.70%	21.90%	20.27%	18.80%	17.47%	16.26%	15.15%
1.00	164.27%	138.92%	119.06%	103.17%	90.23%	79.53%	70.58%	63.01%	56.56%	51.00%	46.18%	41.98%	38.29%	35.04%	32.16%	29.59%	27.30%	25.24%	23.39%	21.72%	20.21%	18.83%	17.58%	16.44%
1.05	166.13%	140.84%	121.03%	105.16%	92.22%	81.52%	72.55%	64.96%	58.47%	52.87%	48.02%	43.77%	40.04%	36.75%	33.82%	31.21%	28.87%	26.77%	24.88%	23.16%	21.61%	20.19%	18.90%	17.72%
1.10	168.03%	142.80%	123.01%	107.15%	94.21%	83.49%	74.50%	66.88%	60.35%	54.72%	49.83%	45.54%	41.77%	38.43%	35.46%	32.81%	30.43%	28.28%	26.35%	24.59%	23.00%	21.55%	20.22%	19.00%
1.15	169.96%	144.77%	125.00%	109.15%	96.19%	85.46%	76.44%	68.78%	62.22%	56.55%	51.61%	47.29%	43.47%	40.09%	37.08%	34.38%	31.96%	29.78%	27.80%	26.01%	24.38%	22.88%	21.52%	20.27%
1.20	171.92%	146.76%	127.00%	111.13%	98.17%	87.40%	78.35%	70.66%	64.06%	58.35%	53.38%	49.01%	45.15%	41.73%	38.67%	35.94%	33.47%	31.25%	29.24%	27.41%	25.74%	24.21%	22.81%	21.52%
1.25	173.89%	148.75%	128.99%	113.11%	100.12%	89.33%	80.25%	72.52%	65.88%	60.13%	55.11%	50.70%	46.80%	43.34%	40.24%	37.47%	34.97%	32.71%	30.65%	28.79%	27.08%	25.52%	24.09%	22.77%
1.30	175.88%	150.74%	130.98%	115.08%	102.06%	91.24%	82.12%	74.35%	67.68%	61.88%	56.82%	52.37%	48.43%	44.93%	41.79%	38.98%	36.44%	34.14%	32.05%	30.15%	28.41%	26.82%	25.35%	24.00%
1.35	177.87%	152.73%	132.95%	117.03%	103.98%	93.12%	83.97%	76.16%	69.44%	63.61%	58.51%	54.01%	50.03%	46.49%	43.31%	40.46%	37.89%	35.55%	33.43%	31.49%	29.72%	28.10%	26.60%	25.22%
1.40	179.87%	154.72%	134.91%	118.96%	105.88%	94.98%	85.79%	77.94%	71.18%	65.30%	60.16%	55.63%	51.61%	48.02%	44.81%	41.92%	39.31%	36.94%	34.79%	32.82%	31.01%	29.36%	27.83%	26.42%
1.45	181.86%	156.69%	136.86%	120.87%	107.75%	96.82%	87.58%	79.69%	72.89%	66.97%	61.79%	57.21%	53.15%	49.53%	46.28%	43.36%	40.71%	38.31%	36.12%	34.12%	32.29%	30.60%	29.04%	27.61%
1.50	183.84%	158.65%	138.78%	122.76%	109.60%	98.62%	89.34%	81.41%	74.57%	68.61%	63.38%	58.77%	54.67%	51.02%	47.73%	44.77%	42.09%	39.65%	37.43%	35.40%	33.54%	31.82%	30.24%	28.78%
1.55	185.81%	160.58%	140.68%	124.62%	111.42%	100.40%	91.08%	83.10%	76.22%	70.22%	64.95%	60.30%	56.17%	52.47%	49.15%	46.15%	43.44%	40.97%	38.72%	36.66%	34.77%	33.02%	31.41%	29.93%
1.60	187.76%	162.50%	142.56%	126.46%	113.21%	102.15%	92.78%	84.76%	77.84%	71.80%	66.49%	61.80%	57.63%	53.90%	50.54%	47.51%	44.77%	42.27%	39.99%	37.90%	35.98%	34.21%	32.57%	31.06%
1.65	189.69%	164.40%	144.41%	128.27%	114.97%	103.86%	94.45%	86.39%	79.42%	73.34%	68.00%	63.27%	59.06%	55.30%	51.91%	48.85%	46.07%	43.54%	41.23%	39.11%	37.16%	35.37%	33.71%	32.17%
1.70	191.61%	166.27%	146.24%	130.04%	116.71%	105.55%	96.10%	87.99%	80.98%	74.86%	69.48%	64.71%	60.47%	56.67%	53.24%	50.15%	47.34%	44.78%	42.45%	40.30%	38.33%	36.50%	34.82%	33.26%
1.75	193.49%	168.11%	148.03%	131.79%	118.40%	107.20%	97.70%	89.56%	82.51%	76.35%	70.92%	66.12%	61.84%	58.01%	54.55%	51.43%	48.59%	46.00%	43.64%	41.47%	39.47%	37.62%	35.91%	34.33%
1.80	195.36%	169.92%	149.79%	133.50%	120.07%	108.82%	99.28%	91.09%	84.00%	77.80%	72.34%	67.50%	63.19%	59.32%	55.83%	52.68%	49.81%	47.20%	44.80%	42.61%	40.58%	38.71%	36.98%	35.37%
1.85	197.19%	171.70%	151.52%	135.18%	121.70%	110.41%	100.82%	92.59%	85.46%	79.22%	73.72%	68.85%	64.50%	60.60%	57.09%	53.90%	51.01%	48.37%	45.95%	43.72%	41.68%	39.78%	38.03%	36.40%
1.90	198.99%	173.45%	153.22%	136.83%	123.30%	111.96%	102.33%	94.06%	86.88%	80.61%	75.08%	70.17%	65.79%	61.86%	58.31%	55.10%	52.18%	49.51%	47.06%	44.82%	42.74%	40.83%	39.05%	37.41%
1.95	200.76%	175.17%	154.89%	138.44%	124.87%	113.48%	103.81%	95.49%	88.28%	81.97%	76.40%	71.46%	67.04%	63.08%	59.51%	56.27%	53.32%	50.62%	48.15%	45.88%	43.79%	41.85%	40.06%	38.39%
2.00	202.50%	176.85%	156.51%	140.02%	126.40%	114.96%	105.25%	96.89%	89.64%	83.29%	77.69%	72.71%	68.27%	64.28%	60.67%	57.41%	54.43%	51.71%	49.22%	46.93%	44.81%	42.85%	41.04%	39.35%

Put Prices with Black & Scholes Option Pricing

H. Pirotte - SBS/ULB - FinMetrics SA - Juin 2006

Price of a B&Sch call option where result=P/S

Cumulative Volatili Sigma*SQRT(T)	Moneyess: Se^{-qT} / Ke^{-rT}																							
	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75
0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.05	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.10	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.15	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.20	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.25	0.23%	0.16%	0.12%	0.08%	0.06%	0.04%	0.03%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.30	0.59%	0.46%	0.35%	0.27%	0.21%	0.16%	0.13%	0.10%	0.07%	0.06%	0.04%	0.03%	0.03%	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
0.35	1.14%	0.92%	0.75%	0.61%	0.50%	0.40%	0.33%	0.27%	0.22%	0.18%	0.15%	0.12%	0.10%	0.08%	0.07%	0.05%	0.04%	0.04%	0.03%	0.02%	0.02%	0.01%	0.01%	0.01%
0.40	1.84%	1.55%	1.30%	1.10%	0.92%	0.78%	0.66%	0.56%	0.47%	0.40%	0.34%	0.29%	0.24%	0.21%	0.18%	0.15%	0.13%	0.11%	0.09%	0.08%	0.07%	0.06%	0.05%	0.04%
0.45	2.68%	2.30%	1.99%	1.71%	1.48%	1.28%	1.11%	0.96%	0.83%	0.73%	0.63%	0.55%	0.48%	0.42%	0.37%	0.32%	0.28%	0.24%	0.21%	0.19%	0.17%	0.15%	0.13%	0.11%
0.50	3.62%	3.17%	2.78%	2.45%	2.15%	1.90%	1.67%	1.48%	1.31%	1.16%	1.03%	0.91%	0.81%	0.72%	0.64%	0.57%	0.51%	0.45%	0.41%	0.36%	0.33%	0.29%	0.26%	0.23%
0.55	4.64%	4.12%	3.67%	3.27%	2.92%	2.61%	2.33%	2.09%	1.88%	1.69%	1.52%	1.36%	1.23%	1.11%	1.00%	0.90%	0.82%	0.74%	0.67%	0.61%	0.55%	0.50%	0.46%	0.42%
0.60	5.72%	5.14%	4.63%	4.17%	3.76%	3.40%	3.08%	2.79%	2.53%	2.30%	2.09%	1.90%	1.73%	1.58%	1.44%	1.32%	1.21%	1.10%	1.01%	0.93%	0.85%	0.78%	0.72%	0.66%
0.65	6.85%	6.21%	5.64%	5.13%	4.67%	4.26%	3.89%	3.56%	3.26%	2.98%	2.74%	2.51%	2.31%	2.13%	1.96%	1.80%	1.67%	1.54%	1.42%	1.31%	1.22%	1.13%	1.05%	0.97%
0.70	8.02%	7.33%	6.70%	6.14%	5.63%	5.18%	4.76%	4.38%	4.04%	3.73%	3.45%	3.19%	2.95%	2.74%	2.54%	2.36%	2.19%	2.04%	1.90%	1.77%	1.65%	1.54%	1.43%	1.34%
0.75	9.22%	8.47%	7.80%	7.19%	6.64%	6.13%	5.68%	5.26%	4.88%	4.53%	4.21%	3.92%	3.65%	3.40%	3.17%	2.96%	2.77%	2.59%	2.43%	2.27%	2.13%	2.00%	1.88%	1.77%
0.80	10.43%	9.64%	8.92%	8.27%	7.67%	7.13%	6.63%	6.17%	5.75%	5.37%	5.02%	4.69%	4.39%	4.11%	3.86%	3.62%	3.40%	3.20%	3.01%	2.83%	2.67%	2.52%	2.37%	2.24%
0.85	11.66%	10.83%	10.06%	9.37%	8.73%	8.15%	7.61%	7.12%	6.66%	6.25%	5.86%	5.50%	5.17%	4.87%	4.58%	4.32%	4.07%	3.85%	3.63%	3.43%	3.25%	3.08%	2.91%	2.76%
0.90	12.90%	12.02%	11.22%	10.48%	9.81%	9.19%	8.62%	8.09%	7.60%	7.15%	6.73%	6.35%	5.99%	5.65%	5.34%	5.05%	4.78%	4.53%	4.30%	4.07%	3.87%	3.67%	3.49%	3.32%
0.95	14.15%	13.23%	12.39%	11.61%	10.90%	10.24%	9.64%	9.08%	8.56%	8.08%	7.63%	7.21%	6.83%	6.47%	6.13%	5.82%	5.52%	5.25%	4.99%	4.75%	4.52%	4.31%	4.11%	3.92%
1.00	15.40%	14.44%	13.56%	12.75%	12.00%	11.31%	10.67%	10.08%	9.53%	9.02%	8.54%	8.10%	7.69%	7.30%	6.94%	6.60%	6.29%	5.99%	5.71%	5.45%	5.20%	4.97%	4.75%	4.54%
1.05	16.64%	15.65%	14.73%	13.89%	13.11%	12.38%	11.71%	11.09%	10.51%	9.98%	9.47%	9.00%	8.57%	8.16%	7.77%	7.41%	7.07%	6.75%	6.45%	6.17%	5.90%	5.65%	5.41%	5.19%
1.10	17.88%	16.85%	15.90%	15.03%	14.21%	13.46%	12.76%	12.11%	11.51%	10.94%	10.41%	9.92%	9.46%	9.02%	8.61%	8.23%	7.87%	7.53%	7.21%	6.91%	6.62%	6.35%	6.10%	5.86%
1.15	19.11%	18.05%	17.07%	16.16%	15.32%	14.54%	13.81%	13.13%	12.50%	11.91%	11.36%	10.84%	10.35%	9.90%	9.47%	9.06%	8.68%	8.32%	7.98%	7.66%	7.36%	7.07%	6.80%	6.54%
1.20	20.34%	19.25%	18.23%	17.30%	16.43%	15.62%	14.86%	14.16%	13.50%	12.88%	12.31%	11.77%	11.26%	10.78%	10.33%	9.90%	9.50%	9.12%	8.77%	8.43%	8.11%	7.80%	7.51%	7.24%
1.25	21.55%	20.43%	19.39%	18.42%	17.52%	16.69%	15.91%	15.18%	14.50%	13.86%	13.26%	12.69%	12.16%	11.66%	11.19%	10.75%	10.33%	9.93%	9.56%	9.20%	8.86%	8.54%	8.24%	7.95%
1.30	22.76%	21.60%	20.53%	19.54%	18.61%	17.75%	16.95%	16.19%	15.49%	14.83%	14.20%	13.62%	13.07%	12.55%	12.06%	11.60%	11.16%	10.74%	10.35%	9.98%	9.63%	9.29%	8.97%	8.67%
1.35	23.94%	22.76%	21.67%	20.65%	19.70%	18.81%	17.98%	17.20%	16.48%	15.79%	15.15%	14.54%	13.97%	13.44%	12.93%	12.45%	11.99%	11.56%	11.15%	10.76%	10.39%	10.04%	9.71%	9.39%
1.40	25.12%	23.91%	22.79%	21.74%	20.77%	19.86%	19.00%	18.21%	17.46%	16.75%	16.09%	15.46%	14.87%	14.32%	13.79%	13.29%	12.82%	12.37%	11.95%	11.54%	11.16%	10.79%	10.44%	10.11%
1.45	26.28%	25.04%	23.90%	22.83%	21.83%	20.89%	20.02%	19.20%	18.43%	17.70%	17.02%	16.38%	15.77%	15.19%	14.65%	14.14%	13.65%	13.18%	12.74%	12.32%	11.92%	11.54%	11.18%	10.84%
1.50	27.42%	26.16%	24.99%	23.89%	22.87%	21.92%	21.02%	20.18%	19.39%	18.65%	17.95%	17.28%	16.66%	16.07%	15.51%	14.97%	14.47%	13.99%	13.54%	13.10%	12.69%	12.30%	11.92%	11.56%
1.55	28.54%	27.26%	26.06%	24.95%	23.91%	22.93%	22.01%	21.15%	20.34%	19.58%	18.86%	18.18%	17.54%	16.93%	16.35%	15.81%	15.29%	14.79%	14.32%	13.88%	13.45%	13.04%	12.65%	12.28%
1.60	29.65%	28.34%	27.12%	25.99%	24.92%	23.93%	22.99%	22.11%	21.28%	20.50%	19.76%	19.07%	18.41%	17.78%	17.19%	16.63%	16.10%	15.59%	15.10%	14.64%	14.20%	13.78%	13.38%	13.00%
1.65	30.74%	29.41%	28.17%	27.01%	25.92%	24.91%	23.95%	23.05%	22.21%	21.41%	20.65%	19.94%	19.27%	18.63%	18.02%	17.44%	16.90%	16.37%	15.88%	15.40%	14.95%	14.52%	14.11%	13.71%
1.70	31.81%	30.45%	29.19%	28.01%	26.91%	25.87%	24.90%	23.98%	23.12%	22.30%	21.53%	20.80%	20.11%	19.46%	18.84%	18.25%	17.69%	17.15%	16.64%	16.16%	15.69%	15.25%	14.82%	14.42%
1.75	32.85%	31.48%	30.20%	29.00%	27.88%	26.82%	25.83%	24.90%	24.02%	23.18%	22.40%	21.65%	20.95%	20.28%	19.65%	19.04%	18.47%	17.92%	17.40%	16.90%	16.42%	15.97%	15.53%	15.12%
1.80	33.88%	32.49%	31.18%	29.97%	28.82%	27.75%	26.74%	25.79%	24.90%	24.05%	23.25%	22.49%	21.77%	21.09%	20.44%	19.82%	19.24%	18.68%	18.14%	17.63%	17.15%	16.68%	16.23%	15.81%
1.85	34.89%	33.47%	32.15%	30.92%	29.76%	28.67%	27.64%	26.67%	25.76%	24.90%	24.08%	23.31%	22.58%	21.88%	21.22%	20.59%	19.99%	19.42%	18.88%	18.35%	17.86%	17.38%	16.92%	16.49%
1.90	35.87%	34.44%	33.10%	31.84%	30.67%	29.56%	28.52%	27.54%	26.61%	25.73%	24.90%	24.12%	23.37%	22.66%	21.99%	21.35%	20.74%	20.15%	19.60%	19.07%	18.56%	18.07%	17.60%	17.16%
1.95	36.83%	35.38%	34.03%	32.75%	31.56%	30.44%	29.38%	28.38%	27.44%	26.55%	25.71%	24.91%	24.15%	23.43%	22.74%	22.09%	21.47%	20.87%	20.31%	19.76%	19.24%	18.75%	18.27%	17.82%
2.00	37.77%	36.31%	34.93%	33.64%	32.43%	31.30%	30.22%	29.21%	28.26%	27.35%	26.50%	25.68%	24.91%	24.18%	23.48%	22.82%	22.18%	21.58%	21.00%	20.45%	19.92%	19.41%	18.93%	18.46%