Solvay Brussels School Economics & Management

ULB

Université Libre de Bruxelles
2011-2012

CORPORATE VALUATION AND FINANCING
GEST-S-408
Prof. H. Pirotte

LASTNAME :

STUDENT Id :

FIRSTNAME :

Final Exam

Form A

Saturday 18 August 2012

Indications

Please follow these indications:

1. The exam lasts 3 hours.
2. Each question has a value of 1 point, unless stated otherwise. There are 26 points in total which allows you some facultative points, but for a maximum total of 20 points at the end.
3. Please verify that your document contains exactly 7 pages.
4. Please write your first name and last name on the first page.
5. MAKE SURE to always state your assumptions if necessary, and to describe your method, beyond the results.
6. Good work!!!

Problems

P1 Asset pricing

You live in a World where there exist only two assets: a risk-free bond and a share of an index fund (which can be considered as the market portfolio). This World is quite myopic since investors limit their time horizon to one year, the economy being then in one of the following two states: "bad" or "good". Your banker wants to sell to you a structured product whose expected value next year is shown in the table below. As the market for this kind of product is completely dried, he did not manage to find a market price, but proposes to sell it to you at 4.5 €.

	Market Value (t=0)	Expected Value (t=1)	
		Bad State	*Good State*
Real Probability		0,3	0,7
Risk-Free Bond	1	1,1	1,1
Index Fund	1	0,5	3
Structured Product	?	5	2

Q1 Using the CAPM, please determine your own estimate of the value of the structured product. Are you ready to buy it at 4.5 € ?

Q2 What's the beta of the structured product?

Q3 Explain why the project's value is higher than its expected cash flow. (5 lines maximum, sanctions if more)

P2 Company valuation

We are on December 31st, 2012. You just finished your studies at the SBS and decide to start your own business in the business of 3D TVs. The initial investment will be € 40 million (amount to be paid on the 31st December 2012) and the company you would like to launch will have the following very summarized income statement for the next 3 years (end of the year – mio. €):

	2013	2014	2015
EBIAT	2,8	4,2	6,3
Depreciation	2	2	2

You also know that:

- The debt of your company will always be equal to 40% of the total value of the company (amount adjusted continuously),
- After 2015 (only), the EBIAT growth rate is expected to be 2% every year,
- Investment cash-flows will be equal to 0 from 2013 to 2015, and equal to depreciation from 2016 onwards,
- The tax rate is 30%,
- The cost of debt of your new company is expected to be 8.3%,
- The WCR of the firm should remain stable,

You want to determine if your company is valuable, but, unfortunately, you didn't manage (as it is relatively new business) to obtain an estimate of the cost of assets. A friend of yours suggests that you can use information relative to a quoted company named 3D&Co (which is exactly in the same business as your company) to obtain your cost of assets (ka). That information is summarized in the following table:

3D&Co	
D/V	20%
ke	11%
kd	6%
tc	30%

Q4 Compute the ka of 3D&Co (assuming that similarly, the debt of 3D&Co is adjusted continuously to maintain D/V constant).

Q5 Compute the WACC of your company and justify the formula you use *(if you did not manage to find an answer to the previous question use a ka of 10%).*

Q6 Compute the terminal value of the company (FCF going from 2016 until infinity) at the end of 2015 *(if you did not manage to find an answer to the previous question use a WACC of 9%).*

Q7 Compute the amounts for the total company value for each year-end of the period 2012-2015.

Q8 Compute the amounts for the value of debt for each year-end of the period 2012-2015. *(if you did not manage to find an answer to question Q3 use a terminal value of € 90 mio.)*

You want to be sure of your computation of the value of the company and decide to use another method where tax shields are **explicitly** modelled, the Capital Cash Flows.

Q9 Compute the terminal value of the levered company in 2015 using the new method.

Q10 Compute the total value of the levered company in 2012 using the new method *(if you did not manage to find an answer to the previous question use a terminal value of € 90 mio.)*

You want to check your results once again using the FTE method (still be coherent with what you did before):

Q11 Compute the annual free cash flows to equity (FTEs) for the years 2012 to 2015.

Q12 Compute the terminal value of equity in 2015 using the FTE method. *(if you did not manage to find an answer to the previous question use a terminal value of € 55 mio. for equity).*

Q13 Compute the total value of equity in 2012 using the FTE method.

P3 Risky debt

You must find the value of a 2-year zero-coupon bond with a face value of €130 million issued by a company (this represents the only debt of the company). The total market value of the company is €120 million today (2012) with a volatility of 40%. The risk-free rate is equal to 5% (annual rate). To answer this question use a binomial tree with steps of 1 year.

Q14 Compute the total default probability and the expected loss given default of this zero-coupon.

Q15 Using the numbers you found in the previous question, compute the value of the debt.

Q16 If the real probability of an up movement is 58%, compute the expected cost of debt of this zero coupon. What's the beta asset of this company (the market premium is 5%)?

Q17 Compute the yield of this bond, can you explain why it is different from the cost of debt?

Q18 If the capital of the company is represented by 10 shares, and if there are 10 bonds issued, compute the value of debt if it was convertible (conversion rate = 1 share for 1 bond)?

P4 "Reading and understanding" questions

The following questions are provided together but are unrelated to each other.

Q19 "**Why do companies issue convertible bonds instead of, say, straight bonds or common stock?**" Please cover this question in detail showing the different arguments and potential counter-arguments that can be raised about it. This question can be answered more deeply if you have read the article of Mayers (2000), "Convertible Bonds Matching Financial and Real Options", *Journal of Applied Corporate Finance*.

[4 points]

Q20 In their paper entitled "The Determinants of Credit Spread Changes" of 2001, Collin-Dufresne, Goldstein and Martin have come up to a striking conclusion.

(1) What kind of determinants of credit spread changes would you expect to have, at first? (can be answered with the knowledge from the course, and not necessarily using the article)

(2) What is the (striking) result they get in their study, source of debate, which debate, and how do they conclude on that?

[4 points]

N(x) & N(-x)=1-N(x) H. Pirotte - SBS/ULB - Juin 2007

	0.000	0.005	0.010	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.055	0.060	0.065	0.070	0.075	0.080	0.085	0.090	0.095
0.0	0.5000	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	0.6368	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	0.9918	0.9919	0.9920	0.9921	0.9922	0.9923	0.9925	0.9926	0.9927	0.9928	0.9929	0.9930	0.9931	0.9931	0.9932	0.9933	0.9934	0.9935	0.9936	0.9937
2.5	0.9938	0.9939	0.9940	0.9940	0.9941	0.9942	0.9943	0.9944	0.9945	0.9945	0.9946	0.9947	0.9948	0.9948	0.9949	0.9950	0.9951	0.9951	0.9952	0.9953
2.6	0.9953	0.9954	0.9955	0.9955	0.9956	0.9957	0.9957	0.9958	0.9959	0.9959	0.9960	0.9960	0.9961	0.9962	0.9962	0.9963	0.9963	0.9964	0.9964	0.9965
2.7	0.9965	0.9966	0.9966	0.9967	0.9967	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	0.9980	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	0.9985	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	0.9992	0.9993	0.9993	0.9993	0.9993	0.9993
3.2	0.9993	0.9993	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995	0.9995	0.9995	0.9995	0.9995
3.3	0.9995	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	0.9997	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	0.9999	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
3.7	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	1.0000
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:	Moneyness: S/K*exp(-rT)																							
Sigma*SQRT(T)	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%	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:	Moneyness: S/K*exp(-rT)																							
Sigma*SQRT(T)	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%