

LASTNAME :

STUDENT Id :

FIRSTNAME :

Final Exam

Form A

Saturday 20 August 2011

Indications

Please follow these indications:

1. The exam lasts 3 hours.
2. Please verify that your document contains exactly 8 pages.
3. Each question is worth one point unless otherwise stated, i.e. there are 22 points in total, including two “bonus” (or facultative) questions of 3 points each.
4. Please write your first name and last name on the first page.
5. Good work!!!

Problems

P1 Opinion required

Please read the following article:

Financial Times, August 20, 2011

US convertible bonds set for dismal month

By Telis Demos in New York

Investors' shift out of higher-risk corporate credits is hitting the convertible bond market, which is on track for its worst monthly performance since the height of the financial crisis.

Prices of the hybrid securities, typically issued as bonds that can be converted to equities, have fallen 6.6 per cent so far in August, according to the Barclays Capital convertibles index. That would be the biggest single-month decline since October 2008.

Their poor run in August, which puts their yearly price decline at 6.4 per cent, outpaces the decline in fortunes for high-yield credits, whose prices have fallen 4.2 per cent so far in August, and 2.7 per cent so far this year, according to Barclays.

[...]

Convertibles, of which about two-thirds of issuers are non-investment grade companies, returned 16.5 per cent last year, among the best performing asset classes, alongside the high-yield sector.

The returns of convertibles so far in 2011 still compare favourably with equity benchmarks such as the Russell 2000 index of small- and mid-cap companies, which matches the profile of convertible issuers. That index has fallen 9.2 per cent so far this year. [...]

[...]

Only about half of convertibles investors are highly leveraged hedge funds, according to analysts, with many long-only mutual fund managers such as Pimco and Loomis Sayles entering the market last year. These fund managers tend to be more focused on credit quality and company fundamentals, and many are still buying in corners of the convertible market.

“We are running a shorter-term portfolio so we better understand our downside protection,” said Tracy Maitland, chairman of Advent Capital Management.

Scarcity may further drive up the value of such convertibles. Issuers are hesitant to sell such short-term paper even at attractive prices, citing the fact that equity options on stocks that have fallen sharply are more valuable.

[...]

- Q1** What are the benefits and risks of convertible bonds?
- Q2** What has caused convertible bond prices to fall to such an extent? Please explain carefully, using the ingredients of the pricing of convertible bonds to answer.
- Q3** Can you provide an explanation of the fact that equity options seem to be better valued than convertible bonds?

P2 Real options

Imagine the following scenario:

Apple is currently building up its iCloud idea, which is to provide “in the cloud” data storage and sharing, a mixture existing alternatives. For that, Apple has to buy considerable server storage and land. Imagine then that Apple considers the following type of contract:

Apple is not yet sure of the success that iCloud can bring. In case of success, Apple needs to make sure to be able to grow its iCloud idea. But to maximise the probability of success, Apple cannot buy just some IT storage and then wait and see. Therefore, Apple needs to buy some huge capacity to be able to have the opportunity to potentially expand further.

Apple has decided therefore to buy IT storage capacity to HP for 1'000'000 TB (terabytes), the cost of 1 TB being USD 100. The current market usage is expected to be of 200'000 TB for a revenue of USD 400 USD/TB and that size would suffice, i.e. the extra TBs over 200'000 would have no expected revenue as today's estimations go. So, Apple will just buy the storage space but without investing any additional money to activate services, connect and run the extra 800'000 TBs today. That would require an extra investment of USD 10 mio and (not to add too much to the complexity of the case) Apple considers that they would examine the decision to activate the additional 800'000 in 3 years from now and it will be a decision on the 800'000 TBs or nothing. The variations of estimations of the current expected market usage) have a volatility of 55%. The risk-free time value of money is assumed to be at 3% annually.

At the same time, HP has proposed to Apple an insurance to buy back the extra 800'000 at USD 60/TB after 3 years, if the market does not increase as expected.

There no obsolescence considered.

- Q4** Show if Apple can justify buying the extra 800'000 TBs today or not. Be creative, show your methodology first and how you would proceed to appraise the problem. And provide a calculation if you can.
(5 points)

P3 Cost of capital

Enrique Menendez is a biologist whose research was enabling him to create a spin-off of his laboratory at the University and is now considering selling the company to a multinational. Enrique would like you to help him value his company. The company still requires heavy financing during the first two years but is expected to grow consistently over the next years. The capacity to survive and afford the big debt burden of the company, which target debt ratio (D/V) is 50%, will clearly rely on the possibility to count on the growth expected from the activity. The beta of equity of similar firms in the sector is 2. The risk-free rate is 3% while the market risk premia is considered to be at 5%. The tax rate is 34%. For the sake of precision and completeness, the beta of debt is assumed to be 1.

For the sake of simplicity, we assume that the beta of debt and the target D/V ratio apply for the firm and the sector as well.

- Q5** In such a setting, what form of WACC would you advocate for any why? (no calculation)

Imagine we expect the following unlevered free cash flows (these are free cash flows for the company, i.e. interest payments have not been subtracted yet) :

Year 0	Year 1	Year 2	Year 3 - ∞
-1000	-500	200	Assume a perpetual residual growth rate of 2% per annum, including to year 3 itself.

- Q6** Compute the required rate of return on assets.
- Q7** Compute the WACC with the model that corresponds to your answer in the first subquestion of this problem.
If you don't have a result for the previous question, please use a required rate of return on assets of 10%.
- Q8** Compute the value of the company using the WACC calculated previously for: year 0, year 1, year 2 and year 3- ∞ .
[2 points]
If you don't have a result for the previous question, please use a WACC of 9%.
- Q9** Compute the present value (in t=0 only) of the company using the Capital Cash Flows approach.
[3 points]
Use the same assumptions presented in the previous questions if you are missing these results.

P4 Mezzanine financing

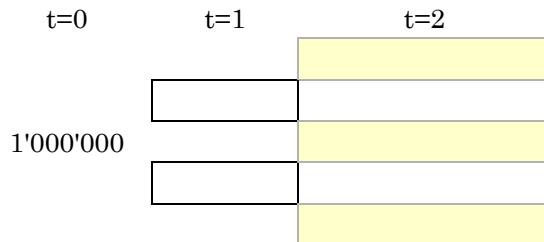
The company Commotrade Inc. has always been financed fully by equity. M. Jackson, the CFO, is thinking about issuing convertible bonds for a face value of 700'000 and buy-back a corresponding amount of equity, so the value of the company won't change but it would have now a leverage of 70%. He has never valued convertible bonds before and therefore, he asks you to provide him with this valuation.

Commotrade has a current market value of 1'000'000 EUR. This value is subject to huge variations with an annual volatility of 45%. The riskfree rate in the market is 3% per year. The

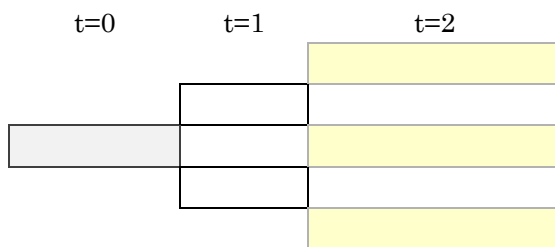
convertible bondholders would have the right to convert at maturity their bonds into 51% of the value of the firm prevailing at maturity. For the simplicity of calculations, we assume that the convertibles bonds are 0-coupon bonds and that the firm does not pay dividends to the shareholders over the same time-horizon. The maturity of the bonds is 2 years.

Q10 If the bonds were simple riskfree 0-coupon bonds without any conversion feature, what would be their value at time 0?

Q11 Using a binomial tree with 1 year time steps like in the following figure, please compute the **potential values for the value of the firm after two years.**



Q12 Using a binomial tree with 1 year time steps like in the following figure, please compute the **present value for the convertible bond** (at t=0).



Q13 Show how the value of the convertible bond can be split into its three components and value them: the risk-free value, the value of the default risk, and the conversion option value. **[3 points]**

Appendices

Binomial Distribution (non cumulative)

number of possible trials n	times goal reached x	probability of goal (1 time)																			
		0.01	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95
2	0	0.9801	0.9025	0.8100	0.7225	0.6400	0.5625	0.4900	0.4225	0.3600	0.3025	0.2500	0.2025	0.1600	0.1225	0.0900	0.0625	0.0400	0.0225	0.0100	0.0025
	1	0.0198	0.0950	0.1800	0.2550	0.3200	0.3750	0.4200	0.4550	0.4800	0.4950	0.5000	0.4950	0.4800	0.4550	0.4200	0.3750	0.3200	0.2550	0.1800	0.0950
	2	0.0001	0.0025	0.0100	0.0225	0.0400	0.0625	0.0900	0.1225	0.1600	0.2025	0.2500	0.3025	0.3600	0.4225	0.4900	0.5625	0.6400	0.7225	0.8100	0.9025
3	0	0.9703	0.8574	0.7290	0.6141	0.5120	0.4219	0.3430	0.2746	0.2160	0.1664	0.1250	0.0911	0.0640	0.0429	0.0270	0.0156	0.0080	0.0034	0.0010	0.0001
	1	0.0294	0.1354	0.2430	0.3251	0.3840	0.4219	0.4410	0.4436	0.4320	0.4084	0.3750	0.3341	0.2880	0.2389	0.1890	0.1406	0.0960	0.0574	0.0270	0.0071
	2	0.0003	0.0071	0.0270	0.0574	0.0960	0.1406	0.1890	0.2389	0.2880	0.3341	0.3750	0.4084	0.4320	0.4436	0.4410	0.4219	0.3840	0.3251	0.2430	0.1354
4	0	0.0000	0.0001	0.0010	0.0034	0.0080	0.0156	0.0270	0.0429	0.0640	0.0911	0.1250	0.1664	0.2160	0.2746	0.3430	0.4219	0.5120	0.6141	0.7290	0.8574
	1	0.9606	0.8145	0.6561	0.5220	0.4096	0.3164	0.2401	0.1785	0.1296	0.0915	0.0625	0.0410	0.0256	0.0150	0.0081	0.0039	0.0016	0.0005	0.0001	0.0000
	2	0.0388	0.1715	0.2916	0.3685	0.4096	0.4219	0.4116	0.3845	0.3456	0.2995	0.2500	0.2005	0.1536	0.1115	0.0756	0.0469	0.0256	0.0115	0.0036	0.0005
	3	0.0006	0.0135	0.0486	0.0975	0.1536	0.2109	0.2646	0.3105	0.3456	0.3675	0.3750	0.3675	0.3456	0.3105	0.2646	0.2109	0.1536	0.0975	0.0486	0.0135
	4	0.0000	0.0005	0.0036	0.0115	0.0256	0.0469	0.0756	0.1115	0.1536	0.2005	0.2500	0.2995	0.3456	0.3845	0.4116	0.4219	0.4096	0.3685	0.2916	0.1715
5	0	0.0000	0.0000	0.0001	0.0005	0.0016	0.0039	0.0081	0.0150	0.0256	0.0410	0.0625	0.0915	0.1296	0.1785	0.2401	0.3164	0.4096	0.5220	0.6561	0.8145
	1	0.9510	0.7738	0.5905	0.4437	0.3277	0.2373	0.1681	0.1160	0.0778	0.0503	0.0313	0.0185	0.0102	0.0053	0.0024	0.0010	0.0003	0.0001	0.0000	0.0000
	2	0.0480	0.2036	0.3281	0.3915	0.4096	0.3955	0.3602	0.3124	0.2592	0.2059	0.1563	0.1128	0.0768	0.0488	0.0284	0.0146	0.0064	0.0022	0.0005	0.0000
	3	0.0010	0.0214	0.0729	0.1382	0.2048	0.2637	0.3087	0.3364	0.3456	0.3369	0.3125	0.2757	0.2304	0.1811	0.1323	0.0879	0.0512	0.0244	0.0081	0.0011
	4	0.0000	0.0011	0.0081	0.0244	0.0512	0.0879	0.1323	0.1811	0.2304	0.2757	0.3125	0.3369	0.3456	0.3364	0.3087	0.2637	0.2048	0.1382	0.0729	0.0214
	5	0.0000	0.0000	0.0005	0.0022	0.0064	0.0146	0.0284	0.0488	0.0768	0.1128	0.1563	0.2059	0.2592	0.3124	0.3602	0.3955	0.4096	0.3915	0.3281	0.2036
	5	0.0000	0.0000	0.0000	0.0001	0.0003	0.0010	0.0024	0.0053	0.0102	0.0185	0.0313	0.0503	0.0778	0.1160	0.1681	0.2373	0.3277	0.4437	0.5905	0.7738

N(x) & N(-x)=1-N(x)

	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

