CHARTERED INSTITUTE FOR SECURITIES & INVESTMENT

DIPLOMA SUMMER 2010 EXAMINATION

FINANCIAL DERIVATIVES

DATE OF EXAM Thursday 24 June 2010

3 HOURS 2.00 pm – 5.00 pm

RUBRIC SECTION A - ***ALL*** questions in this section are to be answered

SECTION B
SECTION C
} Answer **FOUR** questions in total from Sections B and C, at least **TWO** questions from Section B and **ONE** from Section C. The remaining question may be from **EITHER** Section.

Candidates are reminded that no marks will be awarded for illegible work

NOTES TO CANDIDATES

1. Please insert your Candidate Number on the cover of your Answer Book. *Do not insert your name.*
2. Show *all* workings in your Answer Book.
3. Candidates may attempt the sections in any order. Please indicate clearly in your Answer Book which questions you are answering.
4. Please insert in the box provided on the cover of your Answer Book the numbers of the questions you have attempted in the order in which they appear in the Answer Book.
5. You may use the calculator provided or one approved by the Chartered Institute for Securities & Investment.
6. You must hand your Answer Book to an invigilator before you leave the Examination Hall. *Failure to do so will result in disqualification.*
7. Once submitted, the examination scripts become the property of the Chartered Institute for Securities & Investment and will not be returned to candidates.

PLEASE TURN OVER WHEN INSTRUCTED

SECTION A TOTAL 20 MARKS

Answer ALL questions in this section

1 You observe two assets:

asset A with an expected annual return of 10% and an annual volatility of 15%, asset B with an expected annual return of 15% and an annual volatility of 20%.

What input annual volatility would you use to value each of the following derivatives?

a) A call option on a 50/50 basket of the two assets. *(2 marks)*

b) The right to exchange Asset A for Asset B. *(2 marks)*

2 You have entered into a Euro 100 million forward FX contract to buy Euros for dollars at a rate of USD 1.10/Euro in three months' time. The current three month forward rate is USD 1.12/Euro. If the forward rate volatility is 8% per annum, estimate the Value at Risk (VAR) for your position at a two week time horizon at a one-sided 99% confidence level. *(4 marks)*

3 The current date is 15 June 2010 and you observe the LIFFE September 2010 Short Sterling futures contract trading at 99.13 with a last trading day of 15 September 2010. Determine the upper and lower arbitrage bounds on the futures price if the current market interest rates are

3-MONTH	0.6950% – 0.7025%
6-MONTH	0.9525% – 0.9600%

(4 marks)

4 You are provided with the following discount function:

1-PERIOD	0.9800
2-PERIOD	0.9565
3-PERIOD	0.9286
4-PERIOD	0.8917

Estimate the fair value of a three period receive fixed at 2.5% versus pay Libor in arrears interest rate swap. *(4 marks)*

5 The forward curve for a specific asset is:

SPOT	1-MONTH	2-MONTH	3-MONTH
100	100.15	100.75	101.50

The current interest rate curve is flat at 4% per annum, and the asset volatility curve is flat at 20% per annum. Estimate the fair value of a two month 102 strike call using a 2-step binomial model. *(4 marks)*

SECTION B

Answer FOUR questions in total from Sections B and C,
TWO questions from Section B and ONE from Section C.
The remaining question may be from EITHER Section.
All questions in these sections carry 20 marks.

6 You are a corporate treasurer wishing to hedge a £50,000,000 6-month borrowing exposure commencing on 18 July 2010. The current date is 18 May 2010. You observe the following three month Sterling (Short Sterling) interest rate futures prices. The current three month spot Sterling Libor is 0.6965%.

MONTH	JUNE	SEPTEMBER	DECEMBER	MARCH	JUNE
PRICE	99.24	99.09	98.96	98.84	98.66
LAST TRADING DATE	16/6	15/9	15/12	16/3	17/6

Assume settlement on the futures is 2 days after the last trading date, and all dates are business days.

a) Determine the effective borrowing rate you can lock in. *(6 marks)*

b) Estimate the best hedge with Short Sterling futures to offset the exposure, and minimise interest rate and basis risk. *(10 marks)*

c) Discuss any reasons why you believe the hedge you have designed may be imperfect in practice. *(4 marks)*

7 You have entered into a Credit Default Swap on an underlying reference bond issued by ABC Ltd. The original term of the CDS was five years and the payment was at a spread of 200 basis points to be paid annually. The CDS now has two years to run. The current ABC CDS spreads and Sterling interest discount factors are:

	1-YEAR	2-YEAR	3-YEAR	4-YEAR
ANNUAL CDS SPREAD	48 BP	81 BP	117 BP	135 BP
DISCOUNT FACTOR	0.986035	0.971407	0.945246	0.912455

Assume a recovery rate of 30% of notional.

a) On the basis of this market information, estimate the current market value of the CDS if you had purchased protection on a notional £100,000,000 of the reference asset. *(14 marks)*

b) Critically assess all the assumptions you have made in determining the market value. *(6 marks)*

8 You are provided with the following discount factors for Polish Zlotys and Euros.

	ZLOTY	EURO
1-YEAR	0.961260	0.987525
2-YEAR	0.918154	0.975152
3-YEAR	0.874706	0.954032
4-YEAR	0.833281	0.928026
5-YEAR	0.794801	0.896127

The current date is 23 April 2010. You observe that you can buy a Polish government bond maturing 25 April 2014 with a coupon in Polish Zloty of 5.75% at a price of 102.00.

a) Estimate the fair fixed rate on a four year fixed for floating swap in Polish Zlotys. *(4 marks)*

b) Assuming you can do basis swaps between Polish Zlotys and Euros at ±4 basis points, estimate the spread over Floating Euros you could obtain by doing an asset swap with the Polish government bond. *(10 marks)*

c) Describe the way you would hedge the asset swap position if you had sold it to a customer. *(6 marks)*

9 Provide a concise but comprehensive discussion for each of the following issues in options modelling and valuation:

a) Actual return distributions generally display a significantly greater probability of extreme movements than is consistent with a normal distribution for returns. *(7 marks)*

b) The assumption of constant volatility made in conventional derivatives models creates significant misvaluations if volatility is really stochastic. *(6 marks)*

c) Conventional option valuation models have no relevance if appropriate hedging instruments are not available. *(7 marks)*

10 You are an investment bank arranging a range note issue for an issuer. The issuer's funding target is LIBOR -25 Basis Points, and you wish to earn 25 Basis Points in upfront fees on the transaction. You have identified an investor who would be happy to buy a one year note which pays a suitable additional margin over Sterling LIBOR if the FTSE-100 index remains within a 4500 – 6000 range around its current level of 5250, and nothing if the index moves outside that range. You estimate the annual dividend yield on the FTSE-100 index as 3% and the annual volatility of the index as 20.0%. The current one-year LIBOR is 1.50%. Assume all the rates and yields are provided on a continuously compounded basis.

a) Analyse how you would construct such a note, and what margin over LIBOR you could provide to the investor. *(12 marks)*

b) Discuss the risks for the investment bank of hedging such a product through to maturity and possible ways of minimising them. *(8 marks)*

11 You are provided with a set of prices and sensitivities for OEX options traded on the Chicago Mercantile Exchange. These are to be found on **PAGE 7** of this question paper.

The point size of the options is USD 100 per index point. The current date is 14 May 2010. The June options mature on 18 June 2010 and the July options on 16 July 2010. The current value of the OEX index is 516.19.

a) You own the following portfolio of options:

BUY/SELL	OPTION TYPE	POSITION	STRIKE	MATURITY
BUY	PUT	250	505	JUNE
SELL	PUT	150	515	JUNE
SELL	CALL	150	515	JUNE
BUY	CALL	200	510	JULY
BUY	PUT	200	510	JULY

Estimate the dollar change in the value of the overall position, explaining your results, if the OEX index moves to 525 and volatility declines by 2.0% at all strikes over a two week period. Comment on the risk profile of the position. *(8 marks)*

b) For the June positions in the portfolio in a), establish the level of the OEX index at maturity which would mean the overall position broke even. *(3 marks)*

c) Describe and analyse the pattern of implied volatilities you observe for the June and July OEX options. *(3 marks)*

d) Identify two OEX option trades that you believe have a favourable return to risk value, explaining your choice. *(6 marks)*

SECTION C

All questions in this section carry 20 marks.

12 There has been much controversy recently concerning the structuring and trading of synthetic CDOs (Collateralised Debt Obligations) in relation to the Credit Crisis. Discuss the nature of such products, their risks and returns, and why they have proved so controversial.

13 Recent years have seen a rapid increase in the volume of trading in swaps and options and other derivatives based on the spreads between asset prices and yields. Examples would be equity market spreads, Constant Maturity Swap spreads, intermarket interest rate spreads etc. Discuss in detail the issues that arise in modelling and pricing such derivatives compared with conventional derivatives.

14 A major recent innovation in the financing of financial institutions has been the introduction of Tier I Capital Bonds. These bonds generally have a significantly higher yield than conventional bonds, but are automatically converted into equity if the Tier I Capital Ratios of the financial institution falls below a specific level. Discuss the issues involved in modelling and valuing such instruments in a derivatives framework.

15 Attempts to develop exchange traded futures and options on swaps and/or swap rates have so far failed to create significant liquidity. Discuss why this has been the case for previously undertaken contracts, and what alternative approaches, in your view, might the exchanges and/or clearing houses adopt.

PAGE 7

PRICES AND SENSITIVITIES FOR OEX OPTIONS FOR QUESTION 11.

JUNE OEX OPTIONS

	CALLS						PUTS					
STRIKE	PRICE	IMPLIED VOLATILITY	DELTA	GAMMA	7-DAY THETA	VEGA	PRICE	IMPLIED VOLATILITY	DELTA	GAMMA	7-DAY THETA	VEGA
495	29.62	31.47	0.682	0.0073	1.8425	0.5567	11.38	30.10	-0.313	0.0075	1.8901	0.5587
500	26.90	30.23	0.648	0.0079	1.8917	0.5644	11.20	29.12	-0.349	0.0081	1.8372	0.5712
505	23.90	29.01	0.609	0.0085	1.9968	0.5937	13.74	28.11	-0.389	0.0087	1.9152	0.5947
510	19.80	28.01	0.567	0.0091	1.9092	0.6127	14.50	27.12	-0.433	0.0093	1.8927	0.6135
515	15.60	26.77	0.520	0.0086	1.8298	0.6163	17.50	26.02	-0.480	0.0098	1.8548	0.6173
520	13.20	25.79	0.470	0.0099	1.7699	0.6195	18.07	24.96	-0.532	0.0102	1.7324	0.6196
525	10.40	24.67	0.417	0.0102	1.6493	0.6067	22.90	24.22	-0.585	0.0103	1.7139	0.6065
530	8.50	23.33	0.359	0.0103	1.5284	0.5789	25.15	23.54	-0.639	0.0102	1.6022	0.5784
535	6.70	22.51	0.304	0.0100	1.3920	0.5380	26.31	23.00	-0.691	0.0098	1.6561	0.5372
540	4.55	21.58	0.248	0.0094	1.1392	0.4869	32.50	22.32	-0.742	0.0092	1.3371	0.4896

JULY OEX OPTIONS

	CALLS						PUTS					
STRIKE	PRICE	IMPLIED VOLATILITY	DELTA	GAMMA	7-DAY THETA	VEGA	PRICE	IMPLIED VOLATILITY	DELTA	GAMMA	7-DAY THETA	VEGA
480	69.40	31.78	0.727	0.0050	1.4043	0.6863	12.60	39.83	-0.271	0.0050	1.2955	0.6902
490	38.30	29.93	0.679	0.0057	1.3012	0.7513	15.50	29.65	-0.320	0.0057	1.3443	0.7544
500	29.60	28.18	0.623	0.0064	1.2624	0.8011	17.30	28.13	-0.378	0.0063	1.3585	0.8031
510	23.60	26.69	0.557	0.0070	1.2703	0.8319	21.37	26.37	-0.443	0.0070	1.3236	0.8328
520	17.80	24.95	0.482	0.0076	1.2064	0.8411	26.60	25.03	-0.517	0.0075	1.2966	0.8410
530	12.55	23.29	0.399	0.0079	1.0814	0.9278	28.10	23.78	-0.597	0.0076	1.0720	0.8273
540	8.35	21.77	0.313	0.0077	0.9285	0.7344	35.50	22.57	-0.678	0.0074	1.0215	0.7443
550	5.35	20.39	0.228	0.0070	0.7385	0.8669	45.00	21.49	-0.757	0.0068	0.9078	0.6661

TABLE FOR $N(x)$ when $x \leq 0$

This table shows values of $N(x)$ for $x \leq 0$. The table should be used with interpolation. For example

$$\begin{aligned} N(-0.1234) &= N(-0.12) - 0.34[N(-0.12) - N(-0.13)] \\ &= 0.4522 - 0.34 \times (0.4522 - 0.4483) \\ &= 0.4509 \end{aligned}$$

x	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-3.0	0.0014	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
-3.6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
-3.7	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
-3.8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
-3.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
-4.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

TABLE FOR $N(x)$ when $x \geq 0$

This table shows values of $N(x)$ for $x \geq 0$. The table should be used with interpolation. For example

$$\begin{aligned} N(0.6278) &= N(0.62) + 0.78[N(0.63) - N(0.62)] \\ &= 0.7324 + 0.78 \times (0.7357 - 0.7324) \\ &= 0.7350 \end{aligned}$$

x	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
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
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9986	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	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	0.9999	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
3.8	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
4.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000