

KASNEB

CIFA PART III SECTION 6

DERIVATIVES ANALYSIS

FRIDAY: 27 November 2015.

Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

- (a) (i) Describe how an arbitrage opportunity might exist in relation to derivatives markets. (2 marks)
- (ii) Explain the law of one price as applied in derivatives markets. (2 marks)
- (b) The table below illustrates three European call options with the same underlying asset:

	Time to expiration (months)	Exercise price (Sh.)
Option A	6	2,000
Option B	9	2,000
Option C	9	2,500

Required:

Giving appropriate reasons, determine the option with the highest value. (3 marks)

- (c) Explain the following terms with respect to derivative instruments:
- (i) Fiduciary call. (1 mark)
- (ii) Protective put. (1 mark)
- (d) Samuel Mukungi simultaneously purchases an underlying asset priced at Sh.154 and writes a call option on it with an exercise price of Sh.160 and selling at Sh.12.

Required:

- (i) State the term commonly used to describe the position taken by Samuel Mukungi. (1 mark)
- (ii) Determine the value of the position at expiration and the profit (loss) for Samuel Mukungi if the price of the underlying asset at expiration is Sh.140, Sh.150, Sh.160 and Sh.170. (5 marks)
- (iii) The maximum profit and the maximum loss. (2 marks)
- (iv) The expiration price of the underlying which Samuel Mukungi would realise the maximum profit and incur the maximum loss. (2 marks)
- (v) The break-even price at expiration. (1 mark)

(Total: 20 marks)

QUESTION TWO

- (a) Explain two arrangements that could be used to settle the obligations of the parties to a forward contract when it expires. (4 marks)
- (b) (i) Explain the term "credit derivative". (2 marks)
- (ii) Examine two types of credit derivatives. (4 marks)
- (c) Baimunge Mugenda is a Kenyan-based importer of machinery from Britain. He expects the value of the Sterling Pound to appreciate against the Kenyan Shilling (Ksh.) over the next 30 days. He will be making payment on a shipment of imported machinery in 30 days and intends to hedge the currency exposure. The Kenyan risk-free rate is 16.5 per cent and the United Kingdom risk-free rate is 5.0 per cent. These rates are expected to remain constant in the next 30 days.

The current spot rate is Ksh.150 per Sterling Pound.

Required:

- (i) Justify whether Baimunge Mugenda should use a long or a short forward contract to hedge against the currency risk. (2 marks)
- (ii) The no-arbitrage price at which Baimunge Mugenda should enter into for a forward contract that expires in 30 days.
Assume a 365-day year. (4 marks)
- (iii) Compute the value of Baimunge Mugenda's forward position if he moves forward 10 days and the spot rate changes to Ksh.153 per Sterling Pound while the interest rates remain constant. (4 marks)
- (Total: 20 marks)**

QUESTION THREE

- (a) Kimanzi Mutua is the chief trader at the Federal Futures Exchange (FFE), the only futures exchange in his country. One of his duties, is to determine the prices of different types of futures contracts traded at FFE.

Required:

Assess how Kimanzi Mutua could determine the price of the following types of futures contracts traded at FFE:

- (i) Treasury bond futures contracts. (2 marks)
- (ii) Stock index futures contracts. (2 marks)
- (iii) Currency futures contracts. (2 marks)
- (b) A futures contract on a treasury bill expires in 91 days. The treasury bill matures in 182 days. The interest rates on treasury bills are as follows:

91-day treasury bill: 22.13%

182-day treasury bill: 21.84%

Assume a year has 360 days.

Required:

- (i) The appropriate futures price using the prices of the 91-day treasury bill and 182-day treasury bill. (4 marks)
- (ii) The futures price in terms of the underlying asset spot price compounded at the appropriate risk-free rate. (3 marks)
- (iii) Convert the futures price computed in (b) (i) above to the implied discount rate on the futures. (3 marks)
- (iv) Assume that the futures contract is trading in the market at an implied discount rate of 20 basis points lower than is appropriate, given the pricing model and the rule of no arbitrage.

Illustrate how an arbitrage transaction could be executed. Show the outcome. (4 marks)

(Total: 20 marks)

QUESTION FOUR

- (a) Discuss three uses of swaptions. (6 marks)
- (b) Assume that you have just been employed by Fiduciary Investment Bank after completing the CIFA qualification. Your main responsibility is to trade and offer advisory services on derivatives. You are provided with the following information:

Current market price of the share	Sh.92
Exercise price of the call option	Sh.90
Call premium	Sh.10
Delta	0.584
Number of calls sold	2,000
Delta at the end of the previous day	0.68
Continuously compounded risk-free rate	9.0%

Required:

- (i) The number of shares needed to delta-hedge the call position at the end of the previous day. (2 marks)

- (ii) The market value of the portfolio today given that the loan balance at the end of the previous day was Sh.6,000. (3 marks)
- (iii) Illustrate the transactions that would need to be made to adjust the portfolio to be delta-hedged for the following day. (5 marks)
- (c) Omingo Ogot is an equity swap trader. He considers an equity swap in which he would receive the return on Index A in return for paying the return on Index B. At the inception of the equity swap, Index A is at 956.38 and Index B is at 19,734.66. The notional principal of the swap is Sh.30 million.

Required:

The market value of the swap, three months later, when Index A is at 1,048.58 and Index B is at 20,032. (4 marks)
(Total: 20 marks)

QUESTION FIVE

- (a) In derivatives markets, numerous opportunities and strategies exist for managing risk using futures and forwards. Some types of hedges are almost always executed using futures while others are almost always executed using forwards. The choice or preference for one of the above derivative instruments over the other to hedge risk is prompted by their distinct characteristics.

Required:

Evaluate five primary differences between forward contracts and futures contracts that would make a derivatives analyst to prefer one of these derivatives instruments over the other when managing risk. (5 marks)

- (b) The following information relates to a put and a call option on a stock:

Call price, C_0	=	Sh.9.0
Put price, P_0	=	Sh.13.60
Exercise price, X	=	Sh.140
Time to option expiration, T	=	142 days
Current stock price, S_0	=	Sh.134.64
Risk-free rate, r_f	=	6%

One year is assumed to have 365 days.

Required:

Compute the prices of the following using put-call parity:

- (i) Synthetic call option. (2 marks)
- (ii) Synthetic put option. (2 marks)
- (iii) Synthetic bond. (2 marks)
- (iv) Synthetic underlying stock. (2 marks)
- (c) The price of a futures contract is Sh.278.38 and a European call option on this futures contract has an exercise price of Sh.250.00 with a time to expiration of 220 days. The continuously compounded risk-free rate is 21.25 per cent and the volatility is 0.19.

A year is assumed to have 365 days.

Required:

The price of the call using the Black Model. (7 marks)

Hint: The formula for the Black Model is given by:

$$C = e^{-r_f T} [f_0(T) N(d_1) - XN(d_2)]$$

$$P = e^{-r_f T} (X[1 - N(d_2)] - f_0(T) [1 - N(d_1)])$$

Where

$$d_1 = \frac{\ln(f_0(T)/X) + (\sigma^2/2) T}{\sigma \sqrt{T}}$$

$$d_2 = d_1 - \sigma \sqrt{T}$$

$f_0(T)$ = The futures price

C = Price of the European call on a futures contract

X = Exercise price

P = Price of European put

r^c = Continuously compounded risk-free rate

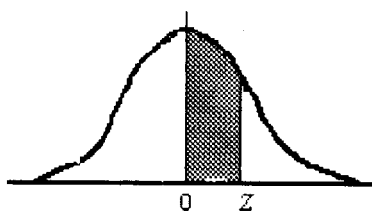
σ = Annualised standard deviation of the continuously compounded return on the stock

(Total: 20 marks)

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NORMAL CURVE

AREAS
under the
STANDARD
NORMAL CURVE
from 0 to z



z	0	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.201	.2051	.2088	.2123	.2157	.2190	.2224
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2996	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000