

KASNEB

CIFA PART III SECTION 6

DERIVATIVES ANALYSIS

PILOT PAPER

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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) Consider a bond portfolio value of Sh.1,036,300 (duration 1.793), a futures value of Sh.102,510 (duration 1.62) and a yield Beta of 1.2.

Required:

- (i) Calculate the required number of contracts to reduce the portfolio duration to zero. (2 marks)
- (ii) Calculate the required number of contracts to achieve a target duration of 1.0. (2 marks)
- (b) Briefly discuss the meaning and importance of the terms “delta”, “theta” and “vega” as applied in option pricing. (6 marks)
- (c) Assume that your company has invested in 100,000 shares of Unglow Ltd., a manufacturer of light bulbs. You are concerned about recent volatility in Unglow Ltd.’s share price due to unpredictable weather. You wish to protect your company’s investment from a possible fall in Unglow Ltd.’s share price until change of weather in three months time, but do not wish to sell the shares at present.

No dividends are due to be paid by Unglow Ltd. during the next three months.

Market data:

Unglow Ltd.’s current share price:	Sh.20
Call option exercise price:	Sh.22
Time to expiry:	3 months
Interest rates (annual):	6%
Volatility of Unglow Ltd.’s shares:	50% (standard deviation per year)

Assume that option contracts are for the purchase or sale of units of 1,000 shares.

Required:

- (i) Devise a delta hedge that is expected to protect the investment against changes in share price until the change of weather. Delta may be estimated using $N(d_1)$. (8 marks)
- (ii) Comment on whether such a hedge is likely to be totally successful. (2 marks)
- (Total: 20 marks)**

QUESTION TWO

- (a) A stock price currently sells for Sh.36. In the next six months, the stock price will either increase to Sh.42 or decrease to Sh.31. The risk free rate is 4% per year.

Required:

Calculate the current price of a call option on the above stock if it’s term to expiration is six months and it’s strike price is Sh.35. (6 marks)

- (b) Explain the following terms:

- (i) Vocational arbitrage. (2 marks)
- (ii) Triangular arbitrage. (2 marks)

(c) The following information is provided about the current spot rate between the United States (US) dollar (\$) and British pound (£), inflation rates in Britain and United States and real interest rates:

- Current spot rate = \$1.4500/£
- US inflation rate = 1.5% per year
- British inflation rate = 2.0% per year
- Real rate of interest = 2.5%

Required:
Using the parity condition:

- (i) Compute the expected spot rate in one year's time. (2 marks)
 - (ii) Assuming that you could borrow \$1,000,000 or £689,700 at the risk free interest rate, demonstrate how you could make an arbitrage profit if you were offered the chance to sell or buy British pound (£) forward for delivery one year from now at the current spot rate of \$1.4500/£. (8 marks)
- (Total: 20 marks)**

QUESTION THREE

(a) State and briefly explain the relationship between a call option price and the following determinants:

- (i) The underlying stock's price. (2 marks)
- (ii) The exercise price. (2 marks)
- (iii) The time to maturity. (2 marks)
- (iv) The risk-free rate. (2 marks)

(b) Zawadi Ltd. is considering introducing an executive share option scheme. The scheme would be offered to all middle level managers of the company. It would replace the existing scheme of performance bonuses linked to the post tax earnings per share of the company. Such bonuses in the last year ranged between Sh.500,000 and Sh.700,000. If the option scheme is introduced new options are expected to be offered to the managers each year.

It is proposed that for the first year, all middle level managers be offered options to purchase 500,000 shares at a price of Sh.500 per share, after the options have been held for one year. If the options are not exercised at that time, they will lapse. Assume that the tax authorities allow the exercise of such options after they have been held for one year.

The company's shares have a current market price of Sh.6.10 per share. The dividend paid was Sh.0.25 per share, a level that has remained constant for the last three years.

Assume that dividends are only paid annually.

The company's share has experienced a standard deviation of 38% during the last year. The short term risk free interest rate is 6% per annum.

Required:
Evaluate whether or not the proposed share option scheme is likely to be attractive to middle level managers of Zawadi Ltd. (8 marks)

(c) When informed of the scheme in (b) above, one middle level manager of Zawadi Ltd. stated that he would rather receive put options than call option, as they would be more valuable to him:

- (i) Explain whether or not Zawadi Ltd. should agree to offer him put options. (2 marks)
 - (ii) Is the manager correct in his statement that put options would be more valuable to him? Explain. (2 marks)
- (Total: 20 marks)**

NB

$$C = S N(d_1) - E(e^{-rt}) \cdot N(d_2)$$

$$\text{Where: } d_1 = \frac{\ln\left(\frac{S}{E}\right) + (rt + 0.5\sigma^2)t}{\sigma\sqrt{t}}$$

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

QUESTION FOUR

(a) The Dennevax Company Ltd. is an import-export company based in Kenya.

On 1 May 2015, the company exported coffee to South Africa on two months credit amounting to South African Rands (SAR) 14,000,000.

Additional information:

1. The rates in the forex and money markets were as follows:

	Ksh/1 SAR
1 May 2015	8.45
1 July 2015	8.40

	Interest rates
Kenya	21% per annum
South Africa	9% per annum

2. In the forex market, the SAR was quoted forward at an annual premium of 27%.

3. The customer settled the amount due on 1 July 2015.

Required:

- (i) Expected two-month forward exchange rate as at 1 July 2015. (2 marks)
- (ii) Advise the Dennevax Company Ltd. on the better hedging strategy between forward contract and money market hedges. (6 marks)
- (b) (i) Explain the advantages of using interest rate swap techniques. (4 marks)
- (ii) Explain the risk involved in using interest rate swap techniques. (2 marks)
- (c) In relation to options markets, distinguish between the following terms:
- (i) Bull spread and bear spread. (2 marks)
- (ii) Box spread and butterfly spread. (2 marks)
- (iii) Straddle and strangles. (2 marks)
- (Total: 20 marks)**

QUESTION FIVE

(a) Consider a stock price at Sh.60 which pays dividend of Sh.5 per share in one month. The risk free rate is 10%. A forward contract expiring in a month was priced at Sh.59.37. One month later the spot price is Sh.62.

Required:

The forward price and the value of the contract at this stage. (6 marks)

(b) A medium sized manufacturing company in South Africa is tendering for an order in Kuwait. The tender conditions state that payment will be made in Kuwait dinars 18 months from now. The company is unsure as to what price to tender.

The company's marginal cost of production at the time of tendering is estimated to be SA rand 1 million and a 25% mark up is normal for the company.

Exchange rates

Dinars/ 1 SAR

Spot 5.467 – 5.503

No forward rate exists for 18 months period

	South Africa	Kuwait
Annual inflation rates	9%	3%
Annual interest rates available to the manufacturing company:		
Borrowing	14%	9%
Lending	9%	3.5%

Required:

(a) Explain how the manufacturing company might protect itself against foreign exchange rate changes. (8 marks)

(b) Recommend the tender price that should be used. (6 marks)

(Total: 20 marks)

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