

Risk Management on Foreign Exchange Practice Questions – Part 2

**Chartered Accountancy
Strategic Level**

Corporate Finance & Risk Management (CFRM)

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CFRM (SL2) - Practice Questions

FOREX RISK MANAGEMENT

Question 01.

Kenduri Co is a large multinational company based in the UK with a number of subsidiary companies around the world. Currently, foreign exchange exposure as a result of transactions between Kenduri Co and its subsidiary companies is managed by each company individually. Kenduri Co is considering whether or not to manage the foreign exchange exposure using multilateral netting from the UK, with the Sterling Pound (£) as the base currency.

If multilateral netting is undertaken, spot mid-rates would be used.

The following cash flows are due in three months between Kenduri Co and three of its subsidiary companies. The subsidiary companies are Lakama Co, based in the United States (currency US\$), Jaia Co, based in Canada (currency CAD) and Gochiso Co, based in Japan (currency JPY).

Owed by	Owed to	Amount
Kenduri Co	Lakama Co	US\$ 4.5 million
Kenduri Co	Jaia Co	CAD 1.1 million
Gochiso Co	Jaia Co	CAD 3.2 million
Gochiso Co	Lakama Co	US\$ 1.4 million
Jaia Co	Lakama Co	US\$ 1.5 million
Jaia Co	Kenduri Co	CAD 3.4 million
Lakama Co	Gochiso Co	JPY 320 million
Lakama Co	Kenduri Co	US\$ 2.1 million

Exchange rates available to Kenduri Co

	US\$/£1	CAD/£1	JPY/£1
Spot	1.5938-1.5962	1.5690-1.5710	131.91-133.59
3-month forward	1.5996-1.6037	1.5652-1.5678	129.15-131.05

Currency options available to Kenduri Co

Contract size £62,500, Exercise price quotation: US\$/£1, Premium: cents per £1

Exercise price	Call Options		Put Options	
	3-month expiry	6-month expiry	3-month expiry	6-month expiry
1.60	1.55	2.25	2.08	2.23
1.62	0.98	1.58	3.42	3.73

It can be assumed that option contracts expire at the end of the relevant month

Annual interest rates available to Kenduri Co and subsidiaries

	Borrowing rate	Investing rate
UK	4.0%	2.8%
United States	4.8%	3.1%
Canada	3.4%	2.1%
Japan	2.2%	0.5%

Required

(a) Advise Kenduri Co on, and recommend, an appropriate hedging strategy for the US\$ cash flows it is due to receive or pay in three months, from Lakama Co. Show all relevant calculations to support the advice given. **(12 marks)**

(b) Calculate, using a tabular format (transactions matrix), the impact of undertaking multilateral netting by Kenduri Co and its three subsidiary companies for the cash flows due in three months. Briefly discuss why some governments allow companies to undertake multilateral netting, while others do not. **(10 marks)**

(c) When examining different currency options and their risk factors, it was noticed that a long call option had a high gamma value. Explain the possible characteristics of a long call option with a high gamma value. **(3 marks)**

(Total = 25 marks)

Question 02.

Casasophia Co, based in a European country that uses the Euro (€), constructs and maintains advanced energy efficient commercial properties around the world. It has just completed a major project in the US and is due to receive the final payment of US\$20 million in four months.

Casasophia Co is planning to commence a major construction and maintenance project in Mazabia, a small African country, in six months' time. This government-owned project is expected to last for three years during which time Casasophia Co will complete the construction of state-of-the-art energy efficient properties and provide training to a local Mazabian company in maintaining the properties.

The carbon-neutral status of the building project has attracted some grant funding from the European Union and these funds will be provided to the Mazabian Government in Mazabian Shillings (MShs).

through a € loan. It is intended that the US\$ receipts will be converted into € and invested in short-dated treasury bills until they are required. These funds plus the loan will be converted into MShs on the date required, at the spot rate at that time.

Mazabia's Government requires Casasophia Co to deposit the MShs2.64 billion it needs for the project, with Mazabia's central bank, at the commencement of the project. In return, Casasophia Co will receive a fixed sum of MShs1.5 billion after tax, at the end of each year for a period of three years. Neither of these amounts is subject to inflationary increases. The relevant risk adjusted discount rate for the project is assumed to be 12%.

Financial information

Exchange rates available to Casasophia

	Per €1	Per €1
Spot	US\$1.3585–US\$1.3618	MShs116–MShs128
4-month forward	US\$1.3588–US\$1.3623	Not available

Currency futures (Contract size €125,000, Quotation: US\$ per €1)

2-month expiry	1.3633
5-month expiry	1.3698

Currency options (Contract size €125,000, Exercise price quotation: US\$ per €1, cents per Euro)

Exercise price	Calls		Puts	
	2-month expiry	5-month expiry	2-month expiry	5-month expiry
1.36	2.35	2.80	2.47	2.98
1.38	1.88	2.23	4.23	4.64

Casasophia Co Local Government Base Rate

2.20%

Mazabia Government Base Rate

10.80%

Yield on short-dated Euro Treasury Bills
(assume 360-day year)

1.80%

Mazabia's current annual inflation rate is 9.7% and is expected to remain at this level for the next six months. However, after that, there is considerable uncertainty about the future and the annual level of inflation could be anywhere between 5% and 15% for the next few years. The country where Casasophia Co is based is expected to have a stable level of inflation at 1.2% per year for the foreseeable future. A local bank in Mazabia has offered Casasophia Co the opportunity to swap the annual income of MShs1.5 billion receivable in each of the next three years for Euros, at the estimated annual MShs/€ forward rates based on the current government base rates.

Required

(a) Advise Casasophia Co on, and recommend, an appropriate hedging strategy for the US\$ income it is due to receive in four months. Include all relevant calculations. (15 marks)

(b) Given that Casasophia Co agrees to the local bank's offer of the swap, calculate the net present value of the project, in six months' time, in €. Discuss whether the swap would be beneficial to Casasophia Co. (10 marks)

(Total = 25 marks)

Question 03.

For a number of years Daikon Co has been using forward rate agreements to manage its exposure to interest rate fluctuations. Recently its chief executive officer (CEO) attended a talk on using exchange-traded derivative products to manage risks. She wants to find out by how much the extra cost of the borrowing detailed below can be reduced, when using interest rate futures, options on interest rate futures, and a collar on the options, to manage the interest rate risk. She asks that detailed calculations for each of the three derivative products be provided and a reasoned recommendation to be made.

Daikon Co is expecting to borrow \$34,000,000 in five months' time. It expects to make a full repayment of the borrowed amount in 11 months' time. Assume it is 1 June 2015 today. Daikon Co can borrow funds at LIBOR plus 70 basis points. LIBOR is currently 3.6%, but Daikon Co expects that interest rates may increase by as much as 80 basis points in five months' time.

The following information and quotes from an appropriate exchange are provided on LIBOR-based \$ futures and options.

Three-month \$ December futures are currently quoted at 95.84. The contract size is \$1,000,000, the tick size is 0.01% and the tick value is \$25. Options on three-month \$ futures, \$1,000,000 contract, tick size 0.01% and tick value \$25. Option premiums are in annual %.

December calls	Strike price	December puts
0.541	95.50	0.304
0.223	96.00	0.508

Initial assumptions

It can be assumed that settlement for both the futures and options contracts is at the end of the month; that basis diminishes to zero at a constant rate until the contract matures and time intervals can be counted in months; that margin requirements may be ignored; and that if the options are in-the-money, they will be exercised at the end of the hedge instead of being sold.

Further issues

In the talk, the CEO was informed of the following issues:

(i) Futures contracts will be marked-to-market daily. The CEO wondered what the impact of this would be if 50 futures contracts were bought at 95.84 on 1 June and 30 futures contracts were sold at 95.61 on 3 June, based on the \$ December futures contract given above. The closing settlement prices are given below for four days:

Date	Settlement price
1 June	95.84
2 June	95.76
3 June	95.66
4 June	95.74

(ii) Daikon Co will need to deposit funds into a margin account with a broker for each contract they have opened, and this margin will need to be adjusted when the contracts are marked-to-market daily.

(iii) It is unlikely that option contracts will be exercised at the end of the hedge period unless they have reached expiry. Instead, they are more likely to be sold and the positions closed.

Required

(a) Based on the three hedging choices available to Daikon Co and the initial assumptions given above, draft a response to the chief executive officer's (CEO) request made in the first paragraph of the question. (15 marks)

(b) Discuss the impact on Daikon Co of each of the three further issues given above. As part of the discussion, include the calculations of the daily impact of the mark-to-market closing prices on the transactions specified by the CEO. (10 marks)

(Total = 25 marks)

Question 04.

Cocoa-Mocha-Chai (CMC) Co is a large listed company based in Switzerland and uses Swiss Francs as its currency. It imports tea, coffee and cocoa from countries around the world, and sells its blended products to supermarkets and large retailers worldwide. The company has production facilities located in two European ports where raw materials are brought for processing, and from where finished products are shipped out. All raw material purchases are paid for in US dollars (US\$), while all sales are invoiced in Swiss Francs (CHF).

Until recently CMC Co had no intention of hedging its foreign currency exposures, interest rate exposures or commodity price fluctuations, and stated this intent in its annual report. However, after consultations with senior and middle managers, the company's new Board of Directors (BoD) has been reviewing its risk management and operations strategies.

The following two proposals have been put forward by the BoD for further consideration:

Proposal one

Setting up a treasury function to manage the foreign currency and interest rate exposures (but not commodity price fluctuations) using derivative products. The treasury function would be headed by the finance director.

The purchasing director, who initiated the idea of having a treasury function, was of the opinion that this would enable her management team to make better decisions. The finance director also supported the idea as he felt this would increase his influence on the BoD and strengthen his case for an increase in his remuneration.

In order to assist in the further consideration of this proposal, the BoD wants you to use the following upcoming foreign currency and interest rate exposures to demonstrate how they would be managed by the treasury function:

- (i) A payment of US\$5,060,000 which is due in four months' time; and
- (ii) A four-year CHF60,000,000 loan taken out to part-fund the setting up of four branches (see proposal two below). Interest will be payable on the loan at a fixed annual rate of 2.2% or a floating annual rate based on the yield curve rate plus 0.40%. The loan's principal amount will be repayable in full at the end of the fourth year.

Proposal two

This proposal suggested setting up four new branches in four different countries. Each branch would have its own production facilities and sales teams. As a consequence of this, one of the two European-based production facilities will be closed. Initial cost-benefit analysis indicated that this would reduce costs related to production, distribution and logistics, as these branches would be closer to the sources of raw materials and also to the customers. The operations and sales directors supported the proposal, as in addition to above, this would enable sales and marketing teams in the branches to respond to any changes in nearby markets more quickly. The branches would be controlled and staffed by the local population in those countries. However, some members of the BoD expressed concern that such a move would create agency issues between CMC Co's central management and the management controlling the branches. They suggested mitigation strategies would need to be established to minimise these issues.

Response from the non-executive directors

When the proposals were put to the non-executive directors, they indicated that they were broadly supportive of the second proposal if the financial benefits outweigh the costs of setting up and running the four branches. However, they felt that they could not support the first proposal, as this would reduce shareholder value because the costs related to undertaking the proposal are likely to outweigh the benefits.

Additional information relating to proposal one

The current spot rate is US\$1.0635 per CHF1. The current annual inflation rate in the US is three times higher than Switzerland.

The following derivative products are available to CMC Co to manage the exposures of the US\$ payment and the interest on the loan:

Exchange-traded currency futures

Contract size CHF125,000 price quotation: US\$ per CHF1

3-month expiry 1.0647

6-month expiry 1.0659

Exchange-traded currency options

Contract size CHF125,000, exercise price quotation: US\$ per CHF1, premium: cents per CHF1

Exercise price	Call Options		Put Options	
	3-month expiry	6-month expiry	3-month expiry	6-month expiry
1.06	1.87	2.75	1.41	2.16
1.07	1.34	2.22	1.88	2.63

It can be assumed that futures and option contracts expire at the end of the month and transaction costs related to these can be ignored.

Over-the-counter products

In addition to the exchange-traded products, Pecunia Bank is willing to offer the following over-the-counter derivative products to CMC Co:

(i) A forward rate between the US\$ and the CHF of US\$ 1.0677 per CHF1.

(ii) An interest rate swap contract with a counterparty, where the counterparty can borrow at an annual floating rate based on the yield curve rate plus 0.8% or an annual fixed rate of 3.8%. Pecunia Bank would charge a fee of 20 basis points each to act as the intermediary of the swap. Both parties will benefit equally from the swap contract.

Required

(a) Advise CMC Co on an appropriate hedging strategy to manage the foreign exchange exposure of the US\$ payment in four months' time. Show all relevant calculations, including the number of contracts bought or sold in the exchange-traded derivative markets. (15 marks)

(b) Demonstrate how CMC Co could benefit from the swap offered by Pecunia Bank. (6 marks)

(c) As an alternative to paying the principal on the loan as one lump sum at the end of the fourth year, CMC Co could pay off the loan in equal annual amounts over the four years similar to an annuity. In this case, an annual interest rate of 2% would be payable, which is the same as the loan's gross redemption yield (yield to maturity).

Required

Calculate the modified duration of the loan if it is repaid in equal amounts and explain how duration can be used to measure the sensitivity of the loan to changes in interest rates. (7 marks)

(d) Prepare a memorandum for the Board of Directors (BoD) of CMC Co which:

(i) Discusses proposal one in light of the concerns raised by the non-executive directors; and (9 marks)

(ii) Discusses the agency issues related to proposal two and how these can be mitigated. (9 marks)

Professional marks will be awarded in part (d) for the presentation, structure, logical flow and clarity of the memorandum. (4 marks)

(Total = 50 marks)

Question 05.

Lignum Co, a large listed company, manufactures agricultural machines and equipment for different markets around the world. Although its main manufacturing base is in France and it uses the Euro (€) as its base currency, it also has a few subsidiary companies around the world. Lignum Co's treasury division is considering how to approach the following three cases of foreign exchange exposure that it faces.

Case One

Lignum Co regularly trades with companies based in Zuhait, a small country in South America whose currency is the Zupesos (ZP). It recently sold machinery for ZP140 million, which it is about to deliver to a company based there. It is expecting full payment for the machinery in four months. Although there are no exchange traded derivative products available for the Zupesos, Medes Bank has offered Lignum Co a choice of two over-the-counter derivative products.

The first derivative product is an over-the-counter forward rate determined on the basis of the Zuhait base rate of 8.5% plus 25 basis points and the French base rate of 2.2% less 30 basis points. Alternatively, with the second derivative product Lignum Co can purchase either Euro call or put options from Medes Bank at an exercise price equivalent to the current spot exchange rate of ZP142 per €1. The option premiums offered are: ZP7 per €1 for the call option or ZP5 per €1 for the put option.

The premium cost is payable in full at the commencement of the option contract. Lignum Co can borrow money at the base rate plus 150 basis points and invest money at the base rate minus 100 basis points in France.

Case Two

Namel Co is Lignum Co's subsidiary company based in Maram, a small country in Asia, whose currency is the Maram Ringit (MR). The current pegged exchange rate between the Maram Ringit and the Euro is MR35 per €1.

Due to economic difficulties in Maram over the last couple of years, it is very likely that the Maram Ringit will devalue by 20% imminently. Namel Co is concerned about the impact of the devaluation on its Statement of Financial Position.

Given below is an extract from the current Statement of Financial Position of Namel Co.

	MR'000
Non-current assets	179,574
Current assets	146,622
Total assets	326,196
Share capital and reserves	102,788
Non-current liabilities	132,237
Current liabilities	91,171
Total capital and liabilities	326,196

The current assets consist of inventories, receivables and cash. Receivables account for 40% of the current assets. All the receivables relate to sales made to Lignum Co in Euro. About 70% of the current liabilities consist of payables relating to raw material inventory purchased from Lignum Co and payable in Euro. 80% of the non-current liabilities consist of a Euro loan and the balance are borrowings sourced from financial institutions in Maram.

Case Three

Lignum Co manufactures a range of farming vehicles in France which it sells within the European Union to countries which use the Euro. Over the previous few years, it has found that its sales revenue from these products has been declining and the sales director is of the opinion that this is entirely due to the strength of the Euro.

Lignum Co's biggest competitor in these products is based in the US and US\$ rate has changed from almost parity with the Euro three years ago, to the current value of US\$1.47 for €1. The agreed opinion is that the US\$ will probably continue to depreciate against the Euro, but possibly at a slower rate, for the foreseeable future.

New machinery

Lignum Co has recently successfully tested a revolutionary new agricultural machine. It is now considering whether to undertake the necessary development work in order to make it a viable commercial product. It believes the development phase will take 3 years costing €2.5m pa (including inflation) following which the machinery will have a market life of 12 years.

Demand is estimated to be 60 units pa. Production requires the use of a special steel alloy whose prices are quite volatile but would be €800,000 at today's prices and Lignum Co intends to sell at a 12.5% premium. Steel alloy prices are expected to rise at 4% pa with a standard deviation of 22%.

Lignum Co would need to take on a new production facility for this engine at the end of the 3 year development phase that will cost €31.4 million. Its cost of capital is 12% and risk-free rate is 5.5%.

Given the volatility involved, Lignum Co is contemplating building a Monte Carlo simulation model to help evaluate this project.

Required

(a) Prepare a report for Lignum Co's treasury division that:

(i) Briefly explains the type of currency exposure Lignum Co faces for each of the above cases.

(3 marks)

(ii) Recommends which of the two derivative products Lignum Co should use to manage its exposure in case one and advises on alternative hedging strategies that could be used. Show all relevant calculations.

(9 marks)

(iii) Computes the gain or loss on Namel Co's Statement of Financial Position, due to the devaluation of the Maram Ringit in case two, and discusses whether and how this exposure should be managed.

(8 marks)

(iv) Discusses how the exposure in case three can be managed.

(3 marks)

Professional marks will be awarded for the structure and presentation of the report. (4 marks)

(b)

(i) Using the Black-Scholes model for valuing real options, estimate the current value of the option to produce the new machinery and determine whether the company should proceed, assuming both production revenues and costs arise at the year-end.

(12 marks)

(ii) Discuss whether it is appropriate for Lignum Co to use Monte Carlo simulation in the evaluation of this opportunity.

(6 marks)

(c) Explain the five input factors that are included in the Black-Scholes model for option valuation.

(5 marks)

(Total = 50 marks)