

FOREIGN EXCHANGE EXPOSURE AND RISK MANAGEMENT

BASIC CONCEPTS AND FORMULAE

1. Foreign Exchange Market

The foreign exchange market is the market in which individuals, firms and banks buy and sell foreign currencies or foreign exchange. The purpose of the foreign exchange market is to permit transfers of purchasing power denominated in one currency to another i.e. to trade one currency for another. Like any other market buyer and seller exist in this market and the demand and supply functions play a big role in determination of exchange rate of the currency.

2. Exchange Rate Determination

An exchange rate is, simply, the price of one nation's currency in terms of another currency, often termed as the reference currency. The foreign exchange market includes both the spot and forward exchange rates.

- (a) The Spot Market: A spot rate occurs when buyers and sellers of currencies agree for immediate delivery of the currency.
- (b) The Forward Market: A forward exchange rate occurs when buyers and sellers of currencies agree to deliver the currency at some future date. The forward exchange rate is set and agreed by the parties and remains fixed for the contract period regardless of the fluctuations in the spot exchange rates in future.

3. Exchange Rate Quotation

- (a) Direct and Indirect Quote: A foreign exchange quotation can be either a direct quotation and or an indirect quotation, depending upon the home currency of the person concerned. A direct quote (also called the European terms) is the home currency price of one unit of foreign currency. An indirect quote (also called the American terms) is the foreign currency price of one unit of the home currency. Mathematically, expressed as follows:

Direct quote = $1/\text{indirect quote}$ and vice versa

- (b) Bid, Offer and Spread: Foreign exchange quotes are two-way quotes, expressed as a 'bid and an offer' (or ask) price. Bid is the price at which the dealer is willing to buy another currency. The offer is the rate at which he is willing to sell another currency.

4. Exchange Rate Forecasting

Corporates need to do the exchange rate forecasting for taking decisions regarding hedging, short-term financing, short-term investment, capital budgeting, earnings assessments and long-term financing. Investors and traders need tools to select and analyze the right data from the vast amount of data available to them to help them make good decisions.

5. Techniques of Exchange Rate Forecasting

There are numerous methods available for forecasting exchange rates. They can be categorized into four general groups- technical, fundamental, market-based, and mixed.

- (a) Technical Forecasting: It involves the use of historical data to predict future values. For example time series models.
- (b) Fundamental Forecasting: It is based on the fundamental relationships between economic variables and exchange rates. For example subjective assessments, quantitative measurements based on regression models and sensitivity analyses.
- (c) Market-Based Forecasting: It uses market indicators to develop forecasts. The current spot/forward rates are often used, since speculators will ensure that the current rates reflect the market expectation of the future exchange rate.
- (d) Mixed Forecasting: It refers to the use of a combination of forecasting techniques. The actual forecast is a weighted average of the various forecasts developed.

6. Exchange Rate Theories

- (a) Interest Rate Parity (IRP): This theory which states that 'the size of the forward premium (or discount) should be equal to the interest rate differential between the two countries of concern'. When interest rate parity exists, covered interest arbitrage (means foreign exchange risk is covered) is not feasible, because any interest rate advantage in the foreign country will be offset by the discount on the forward rate.

Covered Interest Rate Parity equation is given by:

$$(1 + r_D) = \frac{F}{S} (1 + r_F)$$

Where,

$(1 + r_D)$ = Amount that an investor would get after a unit period by investing a rupee in the domestic market at r_D rate of interest and $\frac{F}{S} (1 + r_F)$ is the amount that an investor by investing in the foreign market at r_F so that the investment of one rupee yield same return in the domestic as well as in the foreign market.

Uncovered Interest Rate Parity equation is given by:

$$(1 + r_D) = \frac{S_1}{S} (1 + r_F)$$

Where,

S_1 = Expected future spot rate when the receipts denominated in foreign currency is converted into domestic currency.

- (b) Purchasing Power Parity (PPP): This theory focuses on the 'inflation-exchange rate' relationship.

There are two forms of PPP theory:

- Absolute Form- Also called the 'Law of One Price' suggests that "prices of similar products of two different countries should be equal when measured in a common currency". If a discrepancy in prices as measured by a common currency exists, the demand should shift so that these prices should converge.
- Relative Form – An alternative version that accounts for the possibility of market imperfections such as transportation costs, tariffs, and quotas. It suggests that 'because of these market imperfections, prices of similar products of different countries will not necessarily be the same when measured in a common currency.'

In Equilibrium Form:

$$S = a \frac{P_D}{P_F}$$

Where,

S (Rs./\$) = spot rate

P_D = is the price level in India, the domestic market.

P_F = is the price level in the foreign market, the US in this case.

A = Sectoral price and sectoral shares constant.

- (c) **International Fisher Effect (IFE):** According to this theory, 'nominal risk-free interest rates contain a real rate of return and anticipated inflation'. This means if investors of all countries require the same real return, interest rate differentials between countries may be the result of differential in expected inflation.

The IFE equation can be given by:

$$r_D - P_D = r_F - DP_F \text{ or } P_D - P_F = DS = r_D - r_F$$

7. Comparison of PPP, IRP AND IFE Theories

Theory	Key	Variables	Summary
Interest Rate Parity (IRP)	Forward rate premium (or discount)	Interest rate differential	The forward rate of one currency will contain a premium (or discount) that is determined by the differential in interest rates between the two countries.
Purchasing Power Parity (PPP)	Percentage change in spot exchange rate	Inflation rate differential	The spot rate of one currency with respect to a nother will change in reaction to the differential in inflation rates between two countries.
International Fisher Effect (IFE)	Percentage change in spot exchange rate	Interest rate differential	The spot rate of one currency with respect to a nother will change in accordance with the differential in interest rates between the two countries.

8. Risk Management

A 'risk' is anything that can lead to results that deviate from the requirements. Risk Management is, "any activity which identifies risks, and takes action to remove or control 'negative results' (deviations from the requirements)." Unpredictable changes in interest rates, yield curve structures, exchange rates, and commodity

prices, exacerbated by the explosion in international expansion, have made the financial environment riskier today than it ever was in the past. For this reason, boards of directors, shareholders, and executive and tactical management need to be seriously concerned that corporate risk management activities be adequately assessed, prioritized, driven by strategy, controlled, and reported.

9. Risk Considerations

There are several types of risk that an investor should consider and pay careful attention to. Some types of risk are as follows:

- (a) **Financial Risk:** It is the potential loss or danger due to the uncertainty in movement of foreign exchange rates, interest rates, credit quality, liquidity position, investment price, commodity price, or equity price, as well as the unpredictability of sales price, growth, and financing capabilities.
- (b) **Business Risk:** This risk, also known as investment risk, may materialize because of forecasting errors made in market acceptance of products, future technological changes, and changes in costs related to projects.
- (c) **Credit or Default Risk:** This type of risk is of particular concern to investors who hold bonds within their portfolio.
- (d) **Country Risk:** This refers to the risk that a country would not be able to honour its financial commitments. When a country defaults it can harm the performance of all other financial instruments in that country as well as other countries it has relations with.
- (e) **Interest Rate Risk:** It refers to the change in the interest rates. A rise in interest rates during the term of an investor's debt security hurts the performance of stocks and bonds.
- (f) **Political Risk:** This represents the financial risk that a country's government will suddenly change its policies.
- (g) **Market Risk:** It is the day-to-day fluctuations in a stock's price. It is also referred to as volatility.
- (h) **Foreign Exchange Risk:** Foreign exchange risk applies to all financial instruments that are in a currency other than the domestic currency.

10. Foreign Exchange Exposure

Foreign exchange exposure refers to those parts of a company's business that would be affected if exchange rate changes.

11. Types of Exposures

- (a) **Transaction Exposure:** It measures the effect of an exchange rate change on outstanding obligations that existed before exchange rates changed but were settled after the exchange rate changed. Thus, it deals with cash flows that result from existing contractual obligations.
- (b) **Translation Exposure:** Also known as accounting exposure, it refers to gains or losses caused by the translation of foreign currency assets and liabilities into the currency of the parent company for accounting purposes.
- (c) **Economic Exposure:** It refers to the extent to which the economic value of a company can decline due to changes in exchange rate. It is the overall impact of exchange rate changes on the value of the firm.

12. Techniques for Managing Exposure

The aim of foreign exchange risk management is to stabilize the cash flows and reduce the uncertainty from financial forecasts. Various techniques for managing the exposure are as follows:

- (A) **Derivatives:** A derivatives transaction is a bilateral contract or payment exchange agreement whose value depends on - derives from - the value of an underlying asset, reference rate or index. Every derivatives transaction is constructed from two simple building blocks that are fundamental to all derivatives: forwards and options. They include:
 - (a) **Forwards-based Derivatives:** There are three divisions of forwards-based derivatives:
 - (i) **The Forward Contract:** The simplest form of derivatives is the forward contract. It obliges one party to buy, and the other to sell, a specified quantity of a nominated underlying financial instrument at a specific price, on a specified date in the future.
 - (ii) **Swaps:** Swaps are infinitely flexible. They are a method of exchanging the underlying economic basis of a debt or asset without affecting the underlying principal obligation on the debt or asset.
Swaps can be classified into the following groups:
 - Interest rate;
 - Currency;
 - Commodity; and
 - Equity.

(iii) **Futures Contracts-** A basic futures contract is very similar to the forward contract in its obligation and pay off profile. Some important distinctions between futures and forwards and swaps are:

- The contract terms of futures are standardized.
- All transactions are carried out through the exchange clearing system thus avoiding the other party risk.

(b) **Options:** They offer, in exchange for a premium, the right - but *not* the obligation - to buy or sell the underlying at the strike price during a period or on a specific date. So the owner of the option can choose not to exercise the option and let it expire.

An option is a contract which has one or other of the two key attributes:

- to buy (call option)- It is a contract that gives the buyer the right, but not the obligation, to buy a specified number of units of commodity or a foreign currency from the seller of option at a fixed price on or up to a specific date.
- to sell (put option)- It is a contract that gives the buyer the right, but not the obligation, to sell a specified number of units of commodity or a foreign currency to a seller of option at a fixed price on or up to a specific date.

The holder of an *American option* has the right to exercise the contract at any stage during the period of the option, whereas the holder of a *European option* can exercise his right only at the end of the period.

(B) **Money Market Hedge:** A money market hedge involves simultaneous borrowing and lending activities in two different currencies to lock in the home currency value of a future foreign currency cash flow. The simultaneous borrowing and lending activities enable a company to create a homemade forward contract.

(C) **Forward Market Hedge:** In a forward market hedge, a company that has a long position in a foreign currency will sell the foreign currency forward, whereas a company that has a short position in a foreign currency will buy the foreign currency forward. In this manner, the company can fix the dollar value of future foreign currency cash flow.

- (D) **Netting:** Netting involves associated companies, which trade with each other. The technique is simple. Group companies merely settle inter affiliate indebtedness for the net amount owing. Gross intra-group trade, receivables and payables are netted out.
- (E) **Matching:** Matching is a mechanism whereby a company matches its foreign currency inflows with its foreign currency outflows in respect of amount and approximate timing. Receipts in a particular currency are used to make payments in that currency thereby reducing the need for a group of companies to go through the foreign exchange markets to the unmatched portion of foreign currency cash flows.
- (F) **Leading and Lagging:** Leading means paying an obligation in advance of the due date. Lagging means delaying payment of an obligation beyond its due date. Leading and lagging are foreign exchange management tactics designed to take advantage of expected devaluations and revaluations of currencies.
- (G) **Price Variation:** Price variation involves increasing selling prices to counter the adverse effects of exchange rate change.
- (H) **Invoicing in Foreign Currency:** Sellers usually wish to sell in their own currency or the currency in which they incur cost. This avoids foreign exchange exposure. For the buyer, the ideal currency is usually its own or one that is stable relative to it, or it may be a currency of which the purchaser has reserves.
- (I) **Asset and Liability Management:** Asset and liability management can involve aggressive or defensive postures. In the aggressive attitude, the firm simply increases exposed cash inflows denominated in currencies expected to be strong or increases exposed cash outflows denominated in weak currencies. By contrast, the defensive approach involves matching cash inflows and outflows according to their currency of denomination, irrespective of whether they are in strong or weak currencies.
- (J) **Arbitrage:** The simple notion in arbitrage is to purchase and sell a currency simultaneously in more than one foreign exchange markets. Arbitrage profits are the result of the difference in exchange rates at two different exchange centres and the difference, due to interest yield which can be earned at different exchanges.

13. Strategies for Exposure Management

Four separate strategy options are feasible for exposure management. They are:

- (a) **Low Risk: Low Reward-** This option involves automatic hedging of exposures in the forward market as soon as they arise, irrespective of the attractiveness or otherwise of the forward rate.
- (b) **Low Risk: Reasonable Reward-** This strategy requires selective hedging of exposures whenever forward rates are attractive but keeping exposures open whenever they are not.
- (c) **High Risk: Low Reward-** Perhaps the worst strategy is to leave all exposures unhedged.
- (d) **High Risk: High Reward-** This strategy involves active trading in the currency market through continuous cancellations and re-bookings of forward contracts. With exchange controls relaxed in India in recent times, a few of the larger companies are adopting this strategy.

14. Forward Rate Agreements (FRAs)

FRAs are cash-settled forward contracts on interest rates traded among major international banks active in the Eurodollar market. A bank that sells an FRA agrees to pay the buyer the increased interest cost on some "notional" principal amount if some specified maturity of LIBOR is above a stipulated "forward rate" on the contract maturity or settlement date. Conversely, the buyer agrees to pay the seller any decrease in interest cost if market interest rates fall below the forward rate. Thus, buying an FRA is comparable to selling, or going short, a Eurodollar or LIBOR futures contract.

15. Interest Rate Swaps

In an interest rate swap, the parties to the agreement, termed the swap counterparties, agree to exchange payments indexed to two different interest rates. Total payments are determined by the specified notional principal amount of the swap, which is never actually exchanged. Following are important terms associated with the Interest Rate Swaps:

- (a) **Swap Dealers-** They are the intermediaries.
- (b) **Swap Market Conventions-** There are many different variants of interest rate swaps. The most common is the fixed/floating swap.
- (c) **Timing of Payments-** A swap is negotiated on its "trade date" and takes effect two days later on its initial "settlement date."

- (d) *Price Quotation*-The price of a fixed/floating swap is quoted in two parts: a fixed interest rate and an index upon which the floating interest rate is based. The floating rate can be based on an index of short-term market rates (such as a given maturity of LIBOR) plus or minus a given margin.
- (e) *Generic Swap*-Fixed interest payments on a generic swap typically are based on a 30/360 day-count convention whereas Floating-rate payments are based on an actual/360-day count.
- (f) *Day count Conventions*-Fixed payments can be quoted either on an actual/365 (bond equivalent) basis or on an actual/360 basis. Floating-rate payments indexed to private-sector interest rates typically follow an actual/360 day-count convention commonly used in the money market.
- (g) *Swap Valuation*- Following are two methods used for the valuation of fixed/floating swaps
 - Pricing the Variable-Rate Note
 - Pricing the Fixed Rate Note
- (h) *Non-par Swap*- A swap may be priced such that one party owes money to the other at the initial settlement.

16. Swaptions

An interest rate swaption is simply an option on an interest rate swap. It gives the holder the right but not the obligation to enter into an interest rate swap at a specific date in the future, at a particular fixed rate and for a specified term. For an up-front fee (premium), the customer selects the strike rate (the level at which it enters the interest rate swap agreement), the length of the option period, the floating rate index (Prime, LIBOR, C.P.), and tenor.

Swaptions fall into three main categories:

- a) European Swaptions give the buyer the right to exercise only on the maturity date of the option.
- b) American Swaptions, on the other hand, give the buyer the right to exercise at any time during the option period.
- c) Bermudan Swaptions give the buyer the right to exercise on specific dates during the option period.

17. Principal Features of Swaptions

- A fixed-rate payer swaption gives the buyer of the option the opportunity to lock into a fixed rate through an IRS on an agreed future date.

- The 'option period' refers to the time which elapses between the transaction date and the expiry date.
- The fixed rate of interest on the swaption is called the strike rate.
- The simplest type of swaption available is an option to pay or receive fixed-rate money against receiving or paying floating-rate money.
- At maturity of the swaption, one can decide whether to exercise the swap or to let the swaption lapse unexercised - all rights incurred by the holder will then terminate.
- The underlying instrument on which a swaption is based is a forward-start IRS.
- The buyer of a payer/receiver swaption pays a premium for the right but not the obligation to pay/receive the fixed rate and receive/pay the floating rate of interest on a forward-start IRS.
- The swaption premium is expressed as basis points.
- Swaptions can be cash-settled.
- Marking to market of a swaption depends on the strike rate of the swap and the relationship of the strike price to the underlying, where the underlying is the forward start IRS.
- The intrinsic value would therefore be related to a swap with a start date that coincides with the expiry date of the option.
- In the event of the swaption being cash-settled, the counterparties end up without actually transacting an IRS with each other - the advantage here being an effective management of credit limits.

18. Pricing of Swaptions

Because of its ease of use and market acceptance modified Black and Scholes model is used. However, the modified Black formula has been subject to extensive criticism from various sources over the years.

19. Caps and Floors versus Swaptions

A swaption only has one date of exercise compared to a cap (which is essentially a series of separate call options on forward rates).

20. Uses of Swaptions

- Swaptions can be applied in a variety of ways for both active traders as well as for corporate treasurers.

- Swaptions have become useful tools for hedging embedded option which is common to the natural course of many businesses.
- Swaptions are useful to borrowers targeting an acceptable borrowing rate.
- Swaptions are also useful to those businesses tendering for contracts.
- Swaptions also provide protection on callable/puttable bond issues.

21. Interest Rate Caps

The buyer of an interest rate cap pays the seller a premium in return for the right to receive the difference in the interest cost on some notional principal amount any time a specified index of market interest rates rises above a stipulated "cap rate." The buyer bears no obligation or liability if interest rates fall below the cap rate. Thus, a cap resembles an option that has a right rather than an obligation to the buyer.

Question 1

Outland Steel has a small but profitable export business. Contracts involve substantial delays in payment, but since the company has had a policy of always invoicing in dollars, it is fully protected against changes in exchange rates. More recently the sales force has become unhappy with this, since the company is losing valuable orders to Japanese and German firms that are quoting in customers' own currency. How will you, as Finance Manager, deal with the situation?

Answer

As a Finance Manager to deal with the situation two problems emerge – (i) the problem of negotiating individual contracts and (ii) managing the company's foreign exchange exposure.

The sales force can be allowed to quote in customer's own currency and hedge for currency risk by obtaining the forward contracts etc.

The finance manager can decide whether the company ought to insure. There are two ways of protecting against exchange loss. Firstly, by selling the foreign currency forward and secondly, to borrow foreign currency against its receivables, sell the foreign currency spot and invest the proceeds in the foreign currency say dollars. Interest rate parity theory tells us that in free market the difference between selling forward and selling spot should be exactly equal to difference between the interest on the money one has to pay overseas and the interest one earns from dollars.

Question 2

"Operations in foreign exchange market are exposed to a number of risks." Discuss.

Answer

A firm dealing with foreign exchange may be exposed to foreign currency exposures. The exposure is the result of possession of assets and liabilities and transactions denominated in foreign currency. When exchange rate fluctuates, assets, liabilities, revenues, expenses that have been expressed in foreign currency will result in either foreign exchange gain or loss. A firm dealing with foreign exchange may be exposed to the following types of risks:

- (i) **Transaction Exposure:** A firm may have some contractually fixed payments and receipts in foreign currency, such as, import payables, export receivables, interest payable on foreign currency loans etc. All such items are to be settled in a foreign currency. Unexpected fluctuation in exchange rate will have favourable or adverse impact on its cash flows. Such exposures are termed as transactions exposures.
- (ii) **Translation Exposure:** The translation exposure is also called accounting exposure or balance sheet exposure. It is basically the exposure on the assets and liabilities shown in the balance sheet and which are not going to be liquidated in the near future. It refers to the probability of loss that the firm may have to face because of decrease in value of assets due to devaluation of a foreign currency despite the fact that there was no foreign exchange transaction during the year.
- (iii) **Economic Exposure:** Economic exposure measures the probability that fluctuations in foreign exchange rate will affect the value of the firm. The intrinsic value of a firm is calculated by discounting the expected future cash flows with appropriate discounting rate. The risk involved in economic exposure requires measurement of the effect of fluctuations in exchange rate on different future cash flows.

Question 3

Distinguish between Caps and Collars.

Answer

Caps and Collars: These are derivatives which a finance manager can use to manage his cash-flows effectively and also to reduce the risk involved in case of a major devaluation of currency.

Caps-if a company decides on a particular rate of a currency vis-à-vis the rupee over which it is not ready to take a risk, it can buy a cap at that rate. The cost of caps is very prohibitive and can be offset by selling a 'floor' which is just the opposite of cap. **Collar** – a combination of caps and floors is called collar.

Question 4

The following table shows interest rates for the United States dollar and French francs. The spot exchange rate is 7.05 francs per dollars. Complete the missing entries:

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	3 Months	6 Months	1 Year
<i>Dollar interest rate</i>			
(annually compounded)	11½%	12¼%	?
<i>Franc interest rate</i>			
(annually compounded)	19½	?	20%
<i>Forward franc per dollar</i>	?	?	7.5200
<i>Forward discount per franc</i>			
per cent per year	?	- 6.3%	

Answer

Computation of Missing Entries in the Table

For computing the missing entries in the table we will use interest rates parity theorem (IRP). This theorem states that the exchange rate of two countries will be affected by their interest rate differential. In other words, the currency of one country with a lower interest rate should be at a forward premium in terms of currency of country with higher interest rates and vice versa. This implies that the exchange rate (forward and spot) differential will be equal to the interest rate differential between the two countries i.e.

Interest rate differential = Exchange rate differential

$$\text{or } \frac{(1+r_f)}{(1+r_d)} = \frac{S_{f/d}}{F_{f/d}}$$

Where r_f is the rate of interest of country F (say the foreign country), r_d is rate of interest of country D (say domestic country), $S_{f/d}$ is the spot rate between the two countries F and D and $F_{f/d}$ is the forward rate between the two countries F and D.

3 months

$$\text{Dollar interest rate} = 11\frac{1}{2}\%$$

(annually compounded)

$$\text{Franc interest rate} = 19\frac{1}{2}\%$$

(annually compounded)

Now, Differential in interest rate = Differential between forward and spot rate

i.e. $\frac{1+.115}{1+.195}$ = Differential between forward and spot rate

Or Differential between forward and spot rate = 93.3%

Therefore, Forward discount on franc per cent per year = 100% - 93.3%
= - 6.7%

Forward discount on franc per cent for 3 months = - 6.7/4 or - 1.675%

Forward franc = Today's spot rate (Difference between forward and Spot rate)
= 0.141844 dollar (100% - 1.675%)

Forward franc = 0.1394681 dollar

Forward franc per dollar = 1/.1394681
= 7.17

6 months

Dollar interest rate = $12\frac{1}{4}\%$

(annually compounded)

Forward discount on franc % per year = - 6.3% or - 3.15% for 6 months

Hence 6 months Forward rate = 0.141844 dollar (Spot rate) (100% - 3.15%)
= 0.13737 dollars

Forward francs per dollar = 1/0.13737

or Forward francs per dollar = 7.28 francs

Again, Differential in interest rate = Differential between forward
between the two countries and spot rate

Now, $\frac{1+\text{Dollar interest rate}}{1+\text{Franc interest rate}}$ = Differential between forward and spot rate

Or $\frac{1+.1225}{1+\text{Franc interest rate}}$ = (100% - 6.3%)

Or $\frac{1+.1225}{1+\text{Franc interest rate}}$ = 93.7%

Or $1+\text{Franc interest rate} = \frac{1.1225}{93.7\%}$

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Or Franc interest rate = $1.19797 - 1$

Or = $.19797$

Or = 19.8%

1 Year

Franc interest rate = 20%

(annually compounded)

Forward franc per dollar = 7.5200

Today's spot rate is 7.05 (given) francs per dollar i.e. 1 Franc = 0.141844 dollar

Forward francs is 7.52 francs per dollar i.e. franc = 0.132978 dollar

Difference 0.008866 dollar

Forward discount on Francs per cent per year = $\frac{0.008866}{0.141844} \times 100$
= -6.25% or -6.3%
(rounded off)

Again, Differential in interest rates = Differential between forward
Between the two countries rate and spot rate

$$\text{i.e. } \frac{1 + \text{Dollar interest rate}}{1 + 0.20} = \frac{7.05}{7.52}$$

Or Dollar interest rate = $1.20 \times 0.9374 - 1$
= $1.125 - 1$
= 0.125 or 12.5%

Question 5

Shoe Company sells to a wholesaler in Germany. The purchase price of a shipment is 50,000 deutsche marks with term of 90 days. Upon payment, Shoe Company will convert the DM to dollars. The present spot rate for DM per dollar is 1.71, whereas the 90-day forward rate is 1.70.

You are required to calculate and explain:

- (i) *If Shoe Company were to hedge its foreign-exchange risk, what would it do? What transactions are necessary?*
- (ii) *Is the deutsche mark at a forward premium or at a forward discount?*

(iii) What is the implied differential in interest rates between the two countries?

(Use interest-rate parity assumption).

Answer

- (i) If Shoe Company were to hedge its foreign exchange risk, it would enter into forward contract of selling deutsche marks 90 days forward. It would sell 50,000 deutsche marks 90 days forward. Upon delivery of 50,000 DM 90 days hence, it would receive US \$ 29,412 i.e. 50,000 DM/1.70. If it were to receive US \$ payment today it would receive US \$ 29,240 i.e. 50,000 DM/1.71. Hence, Shoe Company will be better off by \$ 172 if it hedges its foreign exchange risk.
- (ii) The deutsche mark is at a forward premium. This is because the 90 days forward rate of deutsche marks per dollar is less than the current spot rate of deutsche marks per dollar. This implies that deutsche mark is expected to be strengthen i.e. Fewer deutsche mark will be required to buy dollars.
- (iii) The interest rate parity assumption is that high interest rates on a currency are offset by forward discount and low interest rate on a currency is offset by forward premiums.

Further, the spot and forward exchange rates move in tandem, with the link between them based on interest differential. The movement between two currencies to take advantage of interest rates differential is a major determinant of the spread between forward and spot rates. The forward discount or premium is approximately equal to interest differential between the currencies i.e.

$$\frac{F_{(DM/US\$)} - S_{(DM/US\$)}}{S_{(DM/US\$)}} \times \frac{365}{90} = r_{DM} - r_{US\$}$$

$$\text{or } \frac{1.70 - 1.71}{1.71} \times \frac{365}{90} = r_{DM} - r_{US\$}$$

$$\text{Or } -0.0237 = r_{DM} - r_{US\$}$$

Therefore, the differential in interest rate is -2.37%, which means if interest rate parity holds, interest rate in the US should be 2.37% higher than in Germany.

Question 6

Airlines Company entered into an agreement with Airbus for buying latest plans for a total value of F.F. (French Francs) 1,000 Million payable after 6 months. The current spot exchange rate is INR (Indian Rupees) 6.60/FF. The Airlines Company cannot predict the exchange rate in the future. Can the Airlines Company hedge its Foreign Exchange risk? Explain by examples.

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Answer

Airlines Company can hedge its foreign exchange risk by the following ways:

- (i) **Hedging through Forward Contract:** The Company can take full forward cover against foreign exchange exposure and entirely hedge its risk. It can contract with a bank to buy French franc forward at an agreed exchange rate e.g. suppose the 6 months forward rate is INR 6.77/FF. The liability is fixed and the airlines can concentrate on operation. Cost of forward contract

$$= \frac{6.60 - 6.77}{6.60} \times \frac{360}{\text{days}}$$

- (ii) **Foreign Currency Option:** Foreign currency option is the right (not an obligation) to buy or sell a currency at an agreed exchange rate (exercise price) on or before an agreed maturity period. The right to buy is called a call option and right to sell is put option. Suppose, the airlines wants to purchase a 6 months put option. The put option exercise rate (say) is INR 6.70. The Airlines will be required to pay a premium for purchasing the option say 5% of the value of put option INR 6700 × 0.05 = INR 335

Maximum final cost = 6700 + 335 = INR 7035

Suppose at the end of 6 months the exchange rate stay at INR 6.8/FF

Airlines will exercise its put option hence it will sell (pay) INR 6.7

The exercise price to obtain one French Franc in this market, it will be required to pay INR 6.80.

Suppose exchange rate at the end of 6 months is INR 6.35, Airlines should not exercise its option. In the open market it need to pay only INR 6.35 (instead of INR 6.70) to buy one FF. However, it has already paid the option premium.

- (iii) **Money Market Operations:** Airlines can borrow FF 1000 million now, convert them into rupee at the current exchange rate and involve (invest) in money market in India for 6 months. If interest rate parity holds, the difference in the forward rate and the spot rate is the reflection of the difference in the interest rates in two countries. Thus Airlines will be able to hedge against the changes in the exchange rate. The problem with money market is that all markets are not open and all countries are not fully convertible.

Question 7

A customer with whom the Bank had entered into 3 months' forward purchase contract for Swiss Francs 10,000 at the rate of Rs. 27.25 comes to the bank after 2 months and

Foreign Exchange Exposure and Risk Management

requests cancellation of the contract. On this date, the rates, prevailing, are:

Spot	CHF 1 =	Rs. 27.30	27.35
One month forward		Rs. 27.45	27.52

What is the loss/gain to the customer on cancellation?

Answer

The contract would be cancelled at the one month forward sale rate of Rs. 27.52.

	Rs.
Francs bought from customer under original forward contract at:	27.25
It is sold to him on cancellation at:	<u>27.52</u>
Net amount payable by customer per Franc	<u>0.27</u>

At Rs. 0.27 per Franc, exchange difference for CHF 10,000 is Rs. 2,700.

Loss to the Customer:

Exchange difference (Loss) Rs. 2,700

Note: The exchange commission and other service charges are ignored.

Question 8

- (a) On 1st April, 3 months interest rate in the US and Germany are 6.5 per cent and 4.5 per cent per annum respectively. The \$/DM spot rate is 0.6560. What would be the forward rate for DM for delivery on 30th June?
- (b) In International Monetary Market an international forward bid for December, 15 on pound sterling is \$ 1.2816 at the same time that the price of IMM sterling future for delivery on December, 15 is \$ 1.2806. The contract size of pound sterling is £ 62,500. How could the dealer use arbitrage in profit from this situation and how much profit is earned?

Answer

(a)	USD	DM
Spot	0.6560	1.000
Interest rate p.a.	6.5%	4.5%
Interest for 91 days	0.0106	0.0112
Amount after 91 days	0.6666	1.0112
Hence forward rate	<u>0.6666</u>	0.6592
	1.0112	

Strategic Financial Management

OR

$$\text{Forward rate} = \frac{0.6560 \times \left(1 + \frac{0.065}{2}\right)^{\frac{91}{365}}}{\left(1 + \frac{0.045}{2}\right)^{\frac{91}{365}}} = 0.6592$$

- (b) Buy £ 62500 × 1.2806 = \$ 80037.50
 Sell £ 62500 × 1.2816 = \$ 80100.00
 Profit \$ 62.50

Alternatively if the market comes back together before December 15, the dealer could unwind his position (by simultaneously buying £ 62,500 forward and selling a futures contract. Both for delivery on December 15) and earn the same profit of \$ 62.5.

Question 9

In March, 2009, the Multinational Industries make the following assessment of dollar rates per British pound to prevail as on 1.9.2009:

\$/Pound	Probability
1.60	0.15
1.70	0.20
1.80	0.25
1.90	0.20
2.00	0.20

- (i) What is the expected spot rate for 1.9.2009?
 (ii) If, as of March, 2009, the 6-month forward rate is \$ 1.80, should the firm sell forward its pound receivables due in September, 2009?

Answer

- (i) Calculation of expected spot rate for September, 2009:

\$ for £	Probability	Expected \$/£
(1)	(2)	(1) × (2) = (3)
1.60	0.15	0.24

Foreign Exchange Exposure and Risk Management

1.70	0.20	0.34
1.80	0.25	0.45
1.90	0.20	0.38
2.00	<u>0.20</u>	<u>0.40</u>
	<u>1.00</u>	EV = <u>1.81</u>

Therefore, the expected spot value of \$ for £ for September, 2009 would be \$ 1.81.

- (ii) If the six-month forward rate is \$ 1.80, the expected profits of the firm can be maximised by retaining its pounds receivable.

Question 10

ABC Co. have taken a 6 month loan from their foreign collaborators for US Dollars 2 millions. Interest payable on maturity is at LIBOR plus 1.0%. Current 6-month LIBOR is 2%.

Enquiries regarding exchange rates with their bank elicits the following information:

Spot USD 1	Rs. 48.5275
6 months forward	Rs. 48.4575

- (i) What would be their total commitment in Rupees, if they enter into a forward contract?
- (ii) Will you advise them to do so? Explain giving reasons.

Answer

Firstly, the interest is calculated at 3% p.a. for 6 months. That is:

$$\text{USD } 20,00,000 \times 3/100 \times 6/12 = \text{USD } 30,000$$

From the forward points quoted, it is seen that the second figure is less than the first, this means that the currency is quoted at a discount.

- (i) The value of the total commitment in Indian rupees is calculated as below:

Principal Amount of loan	USD 20,00,000
Add: Interest	USD 30,000
Amount due	USD 20,30,000
Spot rate	Rs. 48.5275
Forward Points (6 months)	(-) 0.0700
Forward Rate	Rs. 48.4575
Value of Commitment	Rs. 9,83,68,725

Strategic Financial Management

- (ii) It is seen from the forward rates that the market expectation is that the dollar will depreciate. If the firm's own expectation is that the dollar will depreciate more than what the bank has quoted, it may be worthwhile not to cover forward and keep the exposure open.

If the firm has no specific view regarding future dollar price movements, it would be better to cover the exposure. This would freeze the total commitment and insulate the firm from undue market fluctuations. In other words, it will be advisable to cut the losses at this point of time.

Given the interest rate differentials and inflation rates between India and USA, it would be unwise to expect continuous depreciation of the dollar. The US Dollar is a stronger currency than the Indian Rupee based on past trends and it would be advisable to cover the exposure.

Question 11

A company operating in Japan has today effected sales to an Indian company, the payment being due 3 months from the date of invoice. The invoice amount is 108 lakhs yen. At today's spot rate, it is equivalent to Rs. 30 lakhs. It is anticipated that the exchange rate will decline by 10% over the 3 months period and in order to protect the yen payments, the importer proposes to take appropriate action in the foreign exchange market. The 3 months forward rate is presently quoted as 3.3 yen per rupee. You are required to calculate the expected loss and to show how it can be hedged by a forward contract.

Answer

Spot rate of Re. 1 against yen = $108 \text{ lakhs yen} / \text{Rs. } 30 \text{ lakhs} = 3.6 \text{ yen}$

3 months forward rate of Re. 1 against yen = 3.3 yen

Anticipated decline in Exchange rate = 10%.

Expected spot rate after 3 months = $3.6 \text{ yen} - 10\% \text{ of } 3.6 = 3.6 - 0.36 = 3.24 \text{ yen per rupee}$

	Rs. (in lakhs)
Present cost of 108 lakhs yen	30
Cost after 3 months: $108 \text{ lakhs yen} / 3.24 \text{ yen}$	<u>33.33</u>
Expected exchange loss	<u>3.33</u>

If the expected exchange rate risk is hedged by a Forward contract:

Present cost	30
Cost after 3 months if forward contract	

is taken 108 lakhs yen/ 3.3 yen	<u>32.73</u>
Expected loss	<u>2.73</u>

Suggestion: *If the exchange rate risk is not covered with forward contract, the expected exchange loss is Rs. 3.33 lakhs. This could be reduced to Rs. 2.73 lakhs if it is covered with Forward contract. Hence, taking forward contract is suggested.*

Question 12

The following data relates to ABC Ltd.'s share prices:

Current price per share Rs. 180

Price per share in the futures market-6 months Rs. 195

It is possible to borrow money in the market for securities transactions at the rate of 12% per annum.

Required:

- (i) *Calculate the theoretical minimum price of a 6 month-forward contract.*
- (ii) *Explain if any arbitraging opportunities exist.*

Answer

- (i) **Calculation of theoretical minimum price of a 6 months forward contract**

Theoretical Minimum price = $180 + (180 \times .12 \times 6/12)$ = Rs. 190.80

- (ii) **Existence of Arbitrage Opportunity**

The arbitrageur can borrow money @ 12% for 6 months and buy the share at Rs. 180. At the same time he can sell the shares in the futures market at Rs. 195. On the expiry date, 6 months later, he could deliver the share and collect Rs. 195, pay off Rs. 190.80 and record a profit of Rs. 4.20.

Question 13

The United States Dollar is selling in India at Rs. 45.50. If the interest rate for a 6-months borrowing in India is 8% per annum and the corresponding rate in USA is 2%.

- (i) *Do you expect United States Dollar to be at a premium or at discount in the Indian forward market?*
- (ii) *What is the expected 6-months forward rate for United States Dollar in India; and*
- (iii) *What is the rate of forward premium or discount?*

Strategic Financial Management

Answer

- (i) Under the given circumstances, the USD is expected to quote at a premium in India as the interest rate is higher in India.

- (ii) Calculation of the forward rate:

$$\frac{1+R_h}{1+R_f} = \frac{F_1}{E_0}$$

Where: R_h is home currency interest rate, R_f is foreign currency interest rate, F_1 is end of the period forward rate, and E_0 is the spot rate.

$$\text{Therefore } \frac{1+(0.08/2)}{1+(0.02/2)} = \frac{F_1}{45.50}$$

$$\frac{1+0.04}{1+0.01} = \frac{F_1}{45.50}$$

$$\text{or } \frac{(1.04)}{1.01} \times 45.50 = F_1$$

$$\text{or } \frac{47.32}{1.01} = F_1$$

$$\text{or } F_1 = 46.85$$

- (iii) Rate of premium:

$$\frac{46.85 - 45.50}{45.50} \times \frac{12}{6} \times 100 = 5.93\%$$

Question 14

Which position on the index future gives a speculator, a complete hedge against the following transactions:

- (i) *The share of Right Limited is going to rise. He has a long position on the cash market of Rs. 50 lakhs on the Right Limited. The beta of the Right Limited is 1.25.*
- (ii) *The share of Wrong Limited is going to depreciate. He has a short position on the cash market of Rs. 25 lakhs on the Wrong Limited. The beta of the Wrong Limited is 0.90.*
- (iii) *The share of Fair Limited is going to stagnant. He has a short position on the cash market of Rs. 20 lakhs of the Fair Limited. The beta of the Fair Limited is 0.75.*

Foreign Exchange Exposure and Risk Management

Answer

Sl. No.	Company Name	Trend	Amount (Rs.)	Beta	Index Value (Rs.)	Position
(i)	Right Ltd.	Rise	50 lakh	1.25	62,50,000	Short
(ii)	Wrong Ltd.	Depreciate	25 lakh	0.90	22,50,000	Long
(iii)	Fair Ltd.	Stagnant	20 lakh	0.75	<u>15,00,000</u>	Long
					<u>25,00,000</u>	Short

Question 15

Excel Exporters are holding an Export bill in United States Dollar (USD) 1,00,000 due 60 days hence. They are worried about the falling USD value which is currently at Rs. 45.60 per USD. The concerned Export Consignment has been priced on an Exchange rate of Rs. 45.50 per USD. The Firm's Bankers have quoted a 60-day forward rate of Rs. 45.20.

Calculate:

- (i) Rate of discount quoted by the Bank
- (ii) The probable loss of operating profit if the forward sale is agreed to.

Answer

- (i) Rate of discount quoted by the bank
$$= \frac{(45.20 - 45.60) \times 365 \times 100}{45.20 \times 60} = 5.38\%$$
- (ii) Probable loss of operating profit:
$$(45.20 - 45.50) \times 1,00,000 = \text{Rs. } 30,000$$

Question 16

A customer with whom the Bank had entered into 3 months forward purchase contract for Swiss Francs 1,00,000 at the rate of Rs. 36.25 comes to the bank after two months and requests cancellation of the contract. On this date, the rates are:

Spot	CHF 1 = Rs. 36.30	36.35
One month forward	36.45	36.52

Determine the amount of Profit or Loss to the customer due to cancellation of the contract.

Strategic Financial Management

Answer

Original contract for Swiss Francs 1,00,000 @ 36.25 - amount receivable by the customer. To cancel the purchase contract 1 month before the due date - The contract will be cancelled at 1 month forward sale rate i.e. Swiss Francs 1 = 36.52 payable by the customer.

Hence, Swap profit / loss to the customer:

Rs. 36.52	payable by the customer
Rs. 36.25	receivable by the customer
Rs. 0.27	Net payable by the customer i.e. loss

Therefore, total loss to the customer is

Swiss Francs 1,00,000 × Rs. 0.27 = Rs. 27,000

Question 17

On January 28, 2010 an importer customer requested a bank to remit Singapore Dollar (SGD) 25,00,000 under an irrevocable LC. However, due to bank strikes, the bank could effect the remittance only on February 4, 2010. The interbank market rates were as follows:

	January, 28	February 4
Bombay US\$1	= Rs. 45.85/45.90	45.91/45.97
London Pound 1	= US\$ 1.7840/1.7850	1.7765/1.7775
Pound 1	= SGD 3.1575/3.1590	3.1380/3.1390

The bank wishes to retain an exchange margin of 0.125%. How much does the customer stand to gain or lose due to the delay?

(Calculate rate in multiples of .0001)

Answer

On January 28, 2010 the importer customer requested to remit SGD 25 lakhs.

To consider sell rate for the bank:

US \$	=	Rs. 45.90
Pound 1	=	US\$ 1.7850
Pound 1	=	SGD 3.1575
Therefore, SGD 1	=	$\frac{\text{Rs. 45.90} \times 1.7850}{\text{SGD 3.1575}}$

Foreign Exchange Exposure and Risk Management

SGD 1 = Rs. 25.9482

Add: Exchange margin (0.125%) Rs. 0.0324

Rs. 25.9806

On February 4, 2010 the rates are

US \$ = Rs. 45.97

Pound 1 = US\$ 1.7775

Pound 1 = SGD 3.1380

Therefore, SGD 1 = $\frac{\text{Rs. } 45.97 \times 1.7775}{\text{SGD } 3.1380}$

SGD 1 = Rs. 26.0394

Add: Exchange margin (0.125%) Rs. 0.0325

Rs. 26.0719

Hence, loss to the importer

= SGD 25,00,000 (Rs.26.0719 – Rs.25.9806)

= Rs. 2,28,250

Question 18

You as a dealer in foreign exchange have the following position in Swiss Francs on 31st October, 2009:

	Swiss Francs
<i>Balance in the Nostro A/c Credit</i>	1,00,000
<i>Opening Position Overbought</i>	50,000
<i>Purchased a bill on Zurich</i>	80,000
<i>Sold forward TT</i>	60,000
<i>Forward purchase contract cancelled</i>	30,000
<i>Remitted by TT</i>	75,000
<i>Draft on Zurich cancelled</i>	30,000

What steps would you take, if you are required to maintain a credit Balance of Swiss Francs 30,000 in the Nostro A/c and keep as overbought position on Swiss Francs 10,000?

Strategic Financial Management

Answer

Exchange Position/Currency Position:

<i>Particulars</i>	<i>Purchase Sw. Fcs.</i>	<i>Sale Sw. Fcs.</i>
Opening Balance Overbought	50,000	
Bill on Zurich	80,000	
Forward Sales – TT		60,000
Cancellation of Forward Contract		30,000
TT Sales		75,000
Draft on Zurich cancelled	<u>30,000</u>	—
	1,60,000	1,65,000
Closing Balance Oversold	<u>5,000</u>	—
	1,65,000	1,65,000

Cash Position (Nostro A/c)

	Credit	Debit
Opening balance credit	1,00,000	—
TT sales	—	75,000
	1,00,000	75,000
Closing balance (credit)	—	25,000
	1,00,000	1,00,000

The Bank has to buy spot TT Sw. Fcs. 5,000 to increase the balance in Nostro account to Sw. Fcs. 30,000.

This would bring down the oversold position on Sw. Fcs. As Nil.

Since the bank requires an overbought position of Sw. Fcs. 10,000, it has to buy forward Sw. Fcs. 10,000.

Question 19

You sold Hong Kong Dollar 1,00,00,000 value spot to your customer at Rs. 5.70 & covered yourself in London market on the same day, when the exchange rates were

US\$ 1 = H.K.\$ 7.5880 7.5920

Local inter bank market rates for US\$ were

Spot US\$ 1 = Rs. 42.70 42.85

Calculate cover rate and ascertain the profit or loss in the transaction. Ignore brokerage.

Answer

The bank (Dealer) covers itself by buying from the market at market selling rate.

Rupee – Dollar selling rate	= Rs. 42.85
Dollar – Hong Kong Dollar	= HK \$ 7.5880
Rupee – Hong Kong cross rate	= Rs. 42.85 / 7.5880
	= Rs. 5.6471

Profit / Loss to the Bank

Amount received from customer (1 crore ´ 5.70)	Rs. 5,70,00,000
Amount paid on cover deal (1 crore ´ 5.6471)	<u>Rs. 5,64,71,000</u>
Profit to Bank	<u>Rs. 5,29,000</u>

Question 20

Given the following information:

Exchange rate – Canadian dollar 0.665 per DM (spot)

Canadian dollar 0.670 per DM (3 months)

Interest rates – DM 7% p.a.

Canadian Dollar – 9% p.a.

What operations would be carried out to take the possible arbitrage gains?

Answer

In this case, DM is at a premium against the Can\$.

Premium = $[(0.67 - 0.665) / 0.665] \times (12/3) \times 100 = 3.01$ per cent

Interest rate differential = $9 - 7 = 2$ per cent.

Since the interest rate differential is smaller than the premium, it will be profitable to place money in Deutschmarks the currency whose 3-months interest is lower.

The following operations are carried out:

- (i) Borrow Can\$ 1000 at 9 per cent for 3- months;
- (ii) Change this sum into DM at the spot rate to obtain DM
= $(1000/0.665) = 1503.7$

Strategic Financial Management

- (iii) Place DM 1503.7 in the money market for 3 months to obtain a sum of DM

Principal:	1503.70
Add: Interest @ 7% for 3 months =	<u>26.30</u>
Total	1530.00

- (iv) Sell DM at 3-months forward to obtain Can\$ = $(1530 \times 0.67) = 1025.1$

- (v) Refund the debt taken in Can\$ with the interest due on it, i.e.,

	Can\$
Principal	1000.00
Add: Interest @9% for 3 months	<u>22.50</u>
Total	1022.50

Net arbitrage gain = $1025.1 - 1022.5 = \text{Can\$ } 2.6$

Question 21

XYZ Ltd. is an export oriented business house based in Mumbai. The Company invoices in customers' currency. Its receipt of US \$ 1,00,000 is due on September 1, 2009.

Market information as at June 1, 2009 is:

Exchange Rates		Currency Futures	
US \$/Rs.		US \$/Rs.	Contract size Rs.4,72,000
Spot	0.02140	June	0.02126
1 Month Forward	0.02136	September	0.02118
3 Months Forward	0.02127		

	Initial Margin	Interest Rates in India
June	Rs.10,000	7.50%
September	Rs.15,000	8.00%

On September 1, 2009 the spot rate US \$/Re. is 0.02133 and currency future rate is 0.02134. Comment which of the following methods would be most advantageous for XYZ Ltd.

- (a) Using forward contract
- (b) Using currency futures
- (c) Not hedging currency risks.

Foreign Exchange Exposure and Risk Management

It may be assumed that variation in margin would be settled on the maturity of the futures contract.

Answer

Receipts using a forward contract = $1,00,000/0.02127$ = Rs.47,01,457

Receipts using currency futures

The number of contracts needed is $(1,00,000/0.02118)/4,72,000 = 10$

Initial margin payable is $10 \times \text{Rs.}15,000 = \text{Rs.}1,50,000$

On September 1 Close at 0.02133

Receipts = $\text{US\$}1,00,000/0.02133$ = 46,88,233

Variation Margin = $[(0.02134 - 0.02118) \times 10 \times 472000/-]/0.02133$

OR $(0.00016 \times 10 \times 472000)/.02133 = 755.2/0.02133$ 35,406

47,23,639

Less: Interest Cost – $1,50,000 \times 0.08 \times 3/12$

Rs.3,000

Net Receipts

Rs.47,20,639

Receipts under different methods of hedging

Forward contract

Rs.47,01,457

Futures

Rs.47,20,639

No hedge

US\$ $1,00,000/0.02133$

Rs.46,88,233

The most advantageous option would have been to hedge with futures.

Question 22

Spot rate 1 US \$ = Rs.48.0123

180 days Forward rate for 1 US \$ = Rs.48.8190

Annualised interest rate for 6 months – Rupee = 12%

Annualised interest rate for 6 months – US \$ = 8%

Is there any arbitrage possibility? If yes how an arbitrageur can take advantage of the situation, if he is willing to borrow Rs.40,00,000 or US \$83,312.

Answer

Spot Rate = $\text{Rs.}4000000/- / 83312 = 48.0123$

Forward Premium on US\$ = $[(48.8190 - 48.0123)/48.0123] \times 12/6 \times 100$

Strategic Financial Management

$$= 3.36\%$$

$$\text{Interest rate differential} = 12\% - 8\%$$

$$= 4\% \text{ (Negative Interest rate differential)}$$

Since the negative Interest rate differential is greater than forward premium there is a possibility of arbitrage inflow into India.

The advantage of this situation can be taken in the following manner:

1. Borrow US\$ 83312 for 6 months

Amount to be repaid after 6 months

$$= \text{US \$ } 83312 (1 + 0.08 \times 6/12) = \text{US\$}86644.48$$

2. Convert US\$ 83312 into Rupee and get the principal i.e. Rs.40,00,000

Interest on Investments for 6 months – Rs.4000000/- x 0.06

$$= \text{Rs.}240000/-$$

Total amount at the end of 6 months = Rs.(4000000 + 240000/-)

$$= \text{Rs.}4240000/-$$

Converting the same at the forward rate

$$= \text{Rs.}4240000/- / \text{Rs.}48.8190 =$$

$$= \text{US\$ } 86851.43$$

Hence the gain is US \$ (86851.43 – 86644.48) = US\$ 206.95 OR

Rs.10103 i.e., (\$206.95 x Rs.48.8190)

Question 23

Following are the details of cash inflows and outflows in foreign currency denominations of MNP Co. an Indian export firm, which have no foreign subsidiaries:

Currency	Inflow	Outflow	Spot rate	Forward rate
US \$	4,00,00,000	2,00,00,000	48.01	48.82
French Franc (FFr)	2,00,00,000	80,00,000	7.45	8.12
U.K. £	3,00,00,000	2,00,00,000	75.57	75.98
Japanese Yen	1,50,00,000	2,50,00,000	3.20	2.40

- (i) Determine the net exposure of each foreign currency in terms of Rupees.
- (ii) Are any of the exposure positions offsetting to some extent?

Foreign Exchange Exposure and Risk Management

Answer

(i) Net exposure of each foreign currency in Rupees

	Inflow (Millions)	Outflow (Millions)	Net Inflow (Millions)	Spread	Net Exposure (Millions)
US\$	40	20	20	0.81	16.20
FFr	20	8	12	0.67	8.04
UK£	30	20	10	0.41	4.10
Japan Yen	15	25	-10	-0.80	8.00

(ii) The exposure of Japanese yen position is being offset by a better forward rate

Question 24

AMK Ltd. an Indian based company has subsidiaries in U.S. and U.K.

Forecasts of surplus funds for the next 30 days from two subsidiaries are as below:

U.S. \$12.5 million

U.K. £ 6 million

Following exchange rate information is obtained:

	\$/Rs.	£/Rs.
Spot	0.0215	0.0149
30 days forward	0.0217	0.0150

Annual borrowing/deposit rates (Simple) are available.

Rs. 6.4%/6.2%

\$ 1.6%/1.5%

£ 3.9%/3.7%

The Indian operation is forecasting a cash deficit of Rs.500 million.

It is assumed that interest rates are based on a year of 360 days.

(i) Calculate the cash balance at the end of 30 days period in Rs. for each company under each of the following scenarios ignoring transaction costs and taxes:

(a) Each company invests/finances its own cash balances/deficits in local currency independently.

Strategic Financial Management

(b) Cash balances are pooled immediately in India and the net balances are invested/borrowed for the 30 days period.

(ii) Which method do you think is preferable from the parent company's point of view?

Answer

Cash Balances:

Acting independently

	<u>Capital</u>	<u>Interest</u>	<u>Rs. in 30 days</u>
India	-5,00,000	-2,666.67	-5,02,667
U.S.	12,500	15.63	5,76,757
U.K.	6,000	18.50	4,01,233
			4,75,323

Cash Balances:-

Immediate Cash pooling

	Rs.
India	- 5,00,000
U.S. $\frac{12,500}{0.0215} =$	5,81,395
U.K. $\frac{6,000}{0.0149} =$	4,02,685
	4,84,080

Immediate cash pooling is preferable as it maximizes interest earnings

Note: If the company decides to invest pooled amount of Rs.4,84,080/- @ 6.2% p.a. for 30 days an interest of Rs.2,501/- will accrue.

Question 25

Following information relates to AKC Ltd. which manufactures some parts of an electronics device which are exported to USA, Japan and Europe on 90 days credit terms.

Cost and Sales information:

	Japan	USA	Europe
Variable cost per unit	Rs.225	Rs.395	Rs.510

Foreign Exchange Exposure and Risk Management

<i>Export sale price per unit</i>	<i>Yen 650</i>	<i>US\$10.23</i>	<i>Euro 11.99</i>
<i>Receipts from sale due in 90 days</i>	<i>Yen 78,00,000</i>	<i>US\$1,02,300</i>	<i>Euro 95,920</i>
<i>Foreign exchange rate information:</i>			
	<i>Yen/Rs.</i>	<i>US\$/Rs.</i>	<i>Euro/Rs.</i>
<i>Spot market</i>	<i>2.417-2.437</i>	<i>0.0214-0.0217</i>	<i>0.0177-0.0180</i>
<i>3 months forward</i>	<i>2.397-2.427</i>	<i>0.0213-0.0216</i>	<i>0.0176-0.0178</i>
<i>3 months spot</i>	<i>2.423-2.459</i>	<i>0.02144-0.02156</i>	<i>0.0177-0.0179</i>

Advice AKC Ltd. by calculating average contribution to sales ratio whether it should hedge it's foreign currency risk or not.

Answer

If foreign exchange risk is hedged

				<i>Total (Rs.)</i>
Sum due	Yen 78,00,000	US\$1,02,300	Euro 95,920	
Unit input price	Yen 650	US\$10.23	Euro11.99	
Unit sold	12000	10000	8000	
Variable cost per unit	Rs.225/-	395	510	
Variable cost	Rs.27,00,000	Rs.39,50,000	Rs.40,80,000	Rs.1,07,30,000
Three months forward rate for selling	2.427	0.0216	0.0178	
Rupee value of receipts	Rs.32,13,844	Rs.47,36,111	Rs.53,88,764	Rs.1,33,38,719
Contribution	Rs.5,13,844	Rs.7,86,111	Rs.13,08,764	Rs.26,08,719
Average contribution to sale ratio				19.56%
If risk is not hedged				
Rupee value of receipt	Rs.31,72,021	Rs.47,44,898	Rs.53,58,659	Rs.1,32,75,578
Total contribution				Rs.25,45,578

Strategic Financial Management

Average contribution to sale ratio 19.17%

AKC Ltd. Is advised to hedge its foreign currency exchange risk.

Question 26

A company is considering hedging its foreign exchange risk. It has made a purchase on 1st. January, 2008 for which it has to make a payment of US \$ 50,000 on September 30, 2008. The present exchange rate is 1 US \$ = Rs. 40. It can purchase forward 1 US \$ at Rs. 39. The company will have to make a upfront premium of 2% of the forward amount purchased. The cost of funds to the company is 10% per annum and the rate of corporate tax is 50%. Ignore taxation. Consider the following situations and compute the Profit/Loss the company will make if it hedges its foreign exchange risk:

- (i) *If the exchange rate on September 30, 2008 is Rs. 42 per US \$.*
- (ii) *If the exchange rate on September 30, 2008 is Rs. 38 per US \$.*

Answer

	(Rs.)
Present Exchange Rate Rs.40 = 1 USD	
If company purchases USD 50000 forward premium is	
$50000 \times 39 \times 2\%$	39,000
Interest on Rs.39,000 for 9 months at 10%	2,925
Total hedging cost	41,925
If exchange rate is Rs.42	
Then gain (Rs.42 – 39) for USD 50000	1,50,000
Less: Hedging cost	41,925
Net gain	1,08,075
If USD = Rs.38	
Then loss (39 – 38) for USD 50000	50,000
Add: Hedging Cost	41,925
Total Loss	91,925

Question No. 27

Sun Ltd. is planning to import equipment from Japan at a cost of 3,400 lakh yen. The company may avail loans at 18 percent per annum with quarterly rests with which it can

Foreign Exchange Exposure and Risk Management

import the equipment. The company has also an offer from Osaka branch of an India based bank extending credit of 180 days at 2 percent per annum against opening of an irrecoverable letter of credit.

Additional information:

Present exchange rate Rs.100 = 340 yen

180 day's forward rate Rs.100 = 345 yen

Commission charges for letter of credit at 2 per cent per 12 months.

Advice the company whether the offer from the foreign branch should be accepted.

Answer

Option I (To finance the purchases by availing loan at 18% per annum):

Cost of equipment		<i>Rs. in lakhs</i>
3400 lakh yen at Rs.100 = 340 yen	=	1000
Add: Interest at 4.5% I Quarter	=	45
Add: Interest at 4.5% II Quarter	=	47.03
(on Rs.1045 lakhs)		
Total outflow in Rupees	=	1092.03
Alternatively, interest may also be calculated on compounded basis, i.e.,		
Rs.1000 × [1.045] ²	=	Rs.1092.03

Option II (To accept the offer from foreign branch):

Cost of letter of credit		<i>Rs. in lakhs</i>
At 1 % on 3400 lakhs yen at Rs.100 = 340 yen	=	10.00
Add: Interest I Quarter	=	0.45
Add: Interest II Quarter	=	0.47
(A)	=	10.92

Payment at the end of 180 days:

Cost	3400.00 lakhs yen
Interest at 2% p.a. [3400 × 2/100 × 180/365]	33.53 lakhs yen
	3433.53 lakhs yen
Conversion at Rs.100 = 345 yen [3433.53 / 345 × 100] (B)	= Rs.995.23

Strategic Financial Management

Total Cost: $A + B = 1006.15$ lakhs

Advise: Option no.2 is cheaper by $(1092.03 - 1006.15)$ lakh or 85.88 lakh. Hence, the offer may be accepted.

Question 28

Followings are the spot exchange rates quoted at three different forex markets:

USD/INR	48.30 in Mumbai
GBP/INR	77.52 in London
GBP/USD	1.6231 in New York

The arbitrageur has USD1,00,00,000. Assuming that there are no transaction costs, explain whether there is any arbitrage gain possible from the quoted spot exchange rates.

Answer

The arbitrageur can proceed as stated below to realize arbitrage gains.

- (i) Buy I. Rs. from USD 10,000,000
- | | |
|-----------|--------------------------|
| At Mumbai | $48.3 \times 10,000,000$ |
| | Rs.483,000,000 |
- (ii) Convert I. Rs. to GBP at London
- | | |
|-------|-----------------------------|
| | $\frac{483,000,000}{77.52}$ |
| GBP = | 6,230,650.155 |
- (iii) Convert GBP to USD at New York
- | | |
|-------|-------------------------------|
| | $6,230,650.155 \times 1.6231$ |
| USD = | 10,112,968.26 |
- There is net gain of USD = 10,112,968.26 less 10,000,000
i.e USD = 112,968.26

Question 29

XYZ Ltd. a US firm will need £ 3,00,000 in 180 days. In this connection, the following information is available:

Spot rate 1 £ = \$ 2.00

180 days forward rate of £ as of today = \$1.96

Interest rates are as follows:

	U.K.	US
180 days deposit rate	4.5%	5%
180 days borrowing rate	5%	5.5%

Foreign Exchange Exposure and Risk Management

A call option on £ that expires in 180 days has an exercise price of \$ 1.97 and a premium of \$ 0.04.

XYZ Ltd. has forecasted the spot rates 180 days hence as below:

Future rate	Probability
\$ 1.91	25%
\$ 1.95	60%
\$ 2.05	15%

Which of the following strategies would be most preferable to XYZ Ltd.?

- (a) A forward contract;
- (b) A money market hedge;
- (c) An option contract;
- (d) No hedging.

Show calculations in each case

Answer

(a) Forward contract: Dollar needed in 180 days = £3,00,000 x \$ 1.96 = \$5,88,000/-

(b) Money market hedge: Borrow \$, convert to £, invest £, repay \$ loan in 180 days

Amount in £ to be invested = 3,00,000/1.045 = £ 287081

Amount of \$ needed to convert into £ = 2,87,081 x 2 = \$ 5,74,162

Interest and principal on \$ loan after 180 days = \$5,74,162 x 1.055 = \$ 6,05,741

(c) Call option:

Expected Spot rate in 180 days	Prem. /unit	Exercise Option	Total price per unit	Total price for £3,00,000 xi	Prob. Pi	pixi
1.91	0.04	No	1.95	5,85,000	0.25	1,46,250
1.95	0.04	No	1.99	5,97,000	0.60	3,58,200
2.05	0.04	Yes	2.01	6,03,000	0.15	90,450
						<u>5,94,900</u>

Strategic Financial Management

(d) No hedge option:

<i>Expected Future spot rate</i>	<i>Dollar needed X_i</i>	<i>Prob. P_i</i>	<i>$P_i x_i$</i>
1.91	5,73,000	0.25	1,43,250
1.95	5,85,000	0.60	3,51,000
2.05	6,15,000	0.15	92,250
			5,86,500

The probability distribution of outcomes for no hedge strategy appears to be most preferable because least number of \$ are needed under this option to arrange £3,00,000.

EXERCISES

Question 1

The current ¥/\$ spot rate is 123.00. 6 month European calls with strike 0.0087 and 0.0083 (\$/¥) are trading at premia of ¢ 0.015/¥ and ¢ 0.02/\$ (cents per yen) respectively. A speculator is expecting a fairly strong appreciation of the yen over the next six months. What option strategy should he adopt to profit from this forecast? What is the breakeven rate? How much is the maximum possible profit? Ignore brokerage fees and interest costs/gains.

(Answer: 0.035 cent per yen)

Question 2

(b) If the interest rate for the next 6 months for the US\$ is 1.5% (annual compounding). The interest rate for the € is 2% (annual compounding). The spot price of the € is US \$ 1.665. The forward price is expected to be US\$ 1.664. Please determine correct forward price and recommend an arbitrage strategy.

(Answer: 1.6568)

Question 3

On 30th June 2009 when a forward contract matured for execution you are asked by an importer customer to extend the validity of the forward sale contract for US\$ 10,000 for a further period of three months.

Contracted Rate US\$1 = Rs.41.87

Foreign Exchange Exposure and Risk Management

The US Dollar quoted on 30.6.2009

Spot	Rs. 40.4800/Rs. 40.4900
Premium July	0.1100/0.1300
Premium August	0.2300/0.2500
Premium September	0.3500/0.3750

Calculate the cost for your customer in respect of the extension of the forward contract.
Rupee values to be rounded off to the nearest Rupee.

Margin 0.080% for Buying Rate

Margin 0.25% for Selling Rate

(Answer: Rs. 14,200/-)

Question 4

Wenden Co is a Dutch-based company which has the following expected transactions:

One month: Expected receipt of	£2,40,000
One month: Expected payment of	£1,40,000
Three months: Expected receipts of	£3,00,000

The finance manager has collected the following information:

Spot rate (£ per €):	1.7820 ± 0.0002
One month forward rate (£ per €):	1.7829 ± 0.0003
Three months forward rate (£ per €):	1.7846 ± 0.0004

Money market rates for Wenden Co:

	Borrowing	Deposit
One year Euro interest rate:	4.9%	4.6
One year Sterling interest rate:	5.4%	5.1

Assume that it is now 1 April.

Required:

- (a) Calculate the expected Euro receipts in one month and in three months using the forward market.
- (d) Calculate the expected Euro receipts in three months using a money-market hedge and recommend whether a forward market hedge or a money market hedge should be used.

(Answer: (a) €56,079 and €1,68,067 (b) €167,999 and Market Hedge is preferable)

Strategic Financial Management

Question 5

CQS plc is a UK company that sells goods solely within UK. CQS plc has recently tried a foreign supplier in Netherland for the first time and need to pay €250,000 to the supplier in six months' time. You as financial manager are concerned that the cost of these supplies may rise in Pound Sterling terms and has decided to hedge the currency risk of this account payable. The following information has been provided by the company's bank:

Spot rate (€ per £):	1.998 ± 0.002
Six months forward rate (€ per £):	1.979 ± 0.004

Money market rates available to CQS plc:

Borrowing Deposit

One year Pound Sterling interest rates: 6.1% 5.4%

One year Euro interest rates: 4.0% 3.5%

Assuming CQS plc has no surplus cash at the present time you are required to evaluate whether a money market hedge, a forward market hedge or a lead payment should be used to hedge the foreign account payable.

(Answer: The most expensive hedge is the lead payment, while the cheapest is the forward market hedge and therefore be recommended.)

Question 6

Suppose a dealer quotes 'All-in-cost' for a generic swap at 8% against six month LIBOR flat. If the notional principal amount of swap is Rs.5,00,000,

- Calculate semi-annual fixed payment.
- Find the first floating rate payment for (i) above if the six month period from the effective date of swap to the settlement date comprises 181 days and that the corresponding LIBOR was 6% on the effective date of swap.
- In (ii) above, if the settlement is on 'Net' basis, how much the fixed rate payer would pay to the floating rate payer?

Generic swap is based on 30/360 days basis.

(Answer: (i) Rs.20,000/- (ii) Rs.15,090 or 15,083 (iii) Rs. 4,917)