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**Lecture - 8**  
**Exchange Rate Arithmetic**

Good morning, today we will be discussing about exchange rate arithmetic. Here we will discuss, how exchange rate; that is currency exchange among different currency take place, how the exchange rate determination take place, how the forward exchange rate calculation we do in the market. Actually, we will be discussing actual market phenomenon, and how exchange rate among different currency, we determine by the buying and selling of foreign currency, how the brokers, the banks, the participant in the exchange rate market, decide the exchange rate value.

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### **Methods of Quoting Exchange Rate**

- In India, we practice the direct Quote for exchange rate, where domestic currency ( rupee) is vary against fixed foreign currency.

Exchange Rate Quotation: Direct

US\$1= Rs.53.4525/4550

Bank would sell US\$ : Rs.53.4550(Offer rate)

Bank would purchase US\$: Rs.53.4525(Bid rate)

Offer rate – Bid Rate= Transaction cost+Profit



We will start with method of quoting of exchange rate. As we discussed in earlier example, earlier session, there are two way of quoting of foreign exchange in the market. The first way is, how the direct and indirect quote; that is when you mention direct quote, the value of the domestic currency vary, and the value of the foreign currency remain constant, the value mean number of unit here. And when you mention indirect quote, that value of the domestic currency remain fixed; that is how many foreign

currency equivalent to one unit of domestic currency. In India, up to 1994 economic reform, particularly a foreign exchange market liberalisation.

The exchange rate quotation at present taking place on direct methods. In direct method, the value of the foreign currency; that is the US dollar here, the one unit of US dollar how many rupees, and rupee is varying here. The new number of unit of foreign currency; that is one unit of dollar foreign, US dollar remains constant. When you when you estimate or calculate actual value of the foreign currency; that is the buying and selling rate, we should always behave we are customers, and bank always try to takes more from us.

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US\$ 1 = ₹. 53.4525/4550

Bank sell US\$ 53.4550

Bank buy US\$ 53.4525

$(\text{Offer} - \text{Bid}) \text{ rate} = \text{Transaction cost} + \text{profit margin}$

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In this process if you see here, the example, let it quote US dollar, one US dollar I write here one US dollar is rupee Indian rupee 53.4525 and 4550. Here you see the number of unit of US dollar remain constant, and the value of the domestic currency, the number of unit of domestic currency vary, so it is called direct quote. When you ask about buying and selling; that means, when a customer go to a bank and ask a foreign quote for, then the bank will give a two way quotation, as I as we discussed earlier, two way quotation is essential, because the bank do not want to disclose, whether he is buying or selling the foreign currency. So, when the bank would sell the US dollar, because bank would sell the US dollar at rate of 53.4550, because bank want to take more from customers. Bank

will buy US dollar; means when a bank buy US dollar bank will give rupee to the customer.

The bank will give less rupee to the customer, in this context bank will give a quote 45 53.4525. So, this is bank will sell US dollar, bank will take more Indian rupee and give you one dollar, bank will when you have an US dollar give it to bank, and ask for Indian rupee, bank will give you less Indian rupee and take US dollar. So, this is buying rate, this is selling rate. So, purchase, bank will purchase US dollar at 4525, bank will sell US dollar at 4550. So, this is called offer and bid, bid and offer price. So, when earlier session we discussed about offer minus bid rate, offer minus bid rate; that is called the transaction cost, bank will recover the transaction cost, and also profit margin. So, bid offer rate, offer rate minus bid rate give you the transaction cost and profit margin for the bank. So, here bid rate is bank is bidding US dollar, bank is purchasing US dollar as 4525 the bank is offering US dollar as 4550.

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## Methods of Quoting Exchange Rate

### Two Ways Quotation : Importance

- We cannot know the whether the player is a buyer or seller.
- This eliminates the risk of bad rates or unfavourable rates.
- Continuous buying and selling rates would be available.
- Difficult to distinguish between market makers and takers.
- It limits the profit margin within the bid-ask spread.



Provides depth and liquidity to market.

So, why you need two way quotation, two way quotation there are some advantages for the two way quotation. The two way quotation importance are, we cannot know the whether the player is a buyer or seller in the foreign currency market, because the bidder; that is the banks particularly authorised dealers are there in the market in foreign currency, they do not want to disclose, whether they are buying or selling US dollar. This eliminate the risk of bid rate, suppose a bank need foreign currency, and go for giving

the rate for purchasing of foreign currency, then foreign currency will be costlier for them. All other participant in the market, they will give bid rate or the very higher rate for the foreign currency. So, when bid ask rates are there, where the bid rates and offer rates are there, this eliminate what is called a bid rate or unfavourable rate for a particular customers.

Continuous buying and selling rate would be available, when there is a bid and offer rates are there, there will be continues buying and selling at this rate, because when offer rate and the bid rates are there. The market always there is a continuous buying and selling will be there at these rates. Difficult distinguish between market maker and market takers, because earlier session we discussed about market. Maker market makers are those, who have a command over foreign currency market. Market takers are those, who accept the foreign currency rate. So, market maker and market taker always change their position, because in foreign exchange market, huge volume of transaction takes place. It is very difficult to command over market for long run; at the same time it is very difficult for a particular authorised dealer, to decide the market. So, market maker and market taker change their position continuously.

Whenever, there is a buying and selling rates are there, or two way quotations are there, it is very difficult to distinguish between, who is the market maker, and who is the market taker. Similarly the two way quotation also helps, it limits the profit margin within the bid rate. When we discuss the bid offer rate and bid rate, that decides what is called transaction cost and profit margin. So, when banks give two way quotations, the difference between the buying and selling rate, decide the transaction cost profit margin. This indicates that how much profit the bank is charging, what is the transaction cost. The two way quotation limits, the profit margin and transaction cost. Bank has to reduce the transaction cost, so as to get sizeable amount of profit, in foreign currency transaction process.

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### Cross Exchange Rate

- When direct quote is not available between a pair of currencies, cross exchange rate process is used to find the rate.

**Example :** If exchange rates in Mumbai inter-bank market is US\$1=Rs.53.2550/2600 and in London inter-bank market is US\$1= FRF 7.0550 /7100. What would be the exchange rates between Indian Rupee and FRF.

**Answer:**

- Mumbai inter-bank we need to purchase US\$ by surrendering Rupee.
- Sell US\$ in London Inter-bank market to purchase FRF



After discussing the two way quotation, let us come to the cross exchange rate, because when you discuss, because in actual market, it is very difficult to get what is called a direct exchange rate. When you want the US dollar, then you can get in Indian market US dollar; Bombay inter-bank market you can get US dollar, when you surrender Indian rupee you get the US dollar, but very difficult to get Japanese yen, French franc, or some other currency, which are not tradable in Indian market. You have to go from one market to another market, in this process what is called cross exchange important. When direct quote is not available between pairs of currency, cross exchange rate process is used to find the actual exchange rate. So, lot of let us discuss about one examples. If you see the example here, if exchange rate in Bombay inter-bank market is, one dollar is equal to 53 25 26, and in London inter-bank market is, one franc one dollar is equal to French franc 7.0550, and 7100. What would be the exchange rate between Indian rupee and French franc. Here if you see the example, there is no direct quote available in Indian market, Indian foreign currency market, between Indian rupee and French franc.

So, however, we can get a direct quote between dollar and Indian rupee, and in London market, you will get a direct quote between dollar and French franc. So, somebody in India wants French franc, that person has to travel from Bombay exchange market to the London exchange market; that is they have to go to the authorised dealer. The authorised dealer will surrender, he will purchase US dollar, and US dollar will be sold in London market to get the French franc. So, the cross currency exchange rate importance here. So,

answer will be, here the question answer will be here Bombay inter-bank market need to purchase US dollar by surrendering rupee. And you have to sell the US dollar in London inter-bank market, to purchase the French franc. In this process you can decide, the exchange rate between French franc and Indian rupee. Let us now estimate this, in the Indian Bombay inter-bank market, Bombay inter-bank market we are purchasing dollar we are purchasing US dollar, so when you purchase US dollar, bank will charge more rupee.

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Mumbai Inter-bank  
 purchasing US \$  
 $US \$1 = Rs. 53.2600$

London Inter-bank  
 $US \$1 = FRF 7.0550$

$US \$1 = Rs. 53.2600 = FRF 7.0550$

$FRF 1 = Rs. 7.5492$

$Rs. 53.2600 = FRF 7.0550$   
 $FRF 1 = \frac{53.2600}{7.0550} = Rs. 7.5492$

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So, the rate will be one US dollar, one US dollar would be 53, you need to surrender more rupee, so 53.2600. So, in Indian London in the Bombay inter-bank market, US dollar will be quoted for purchasing US dollar, you have to surrender 53.26, and after purchasing US dollar, you have to go to London inter-bank market. In London market, in London inter-bank market, you have to sell us dollar, when you are selling US dollar the market will give you less franc. So, in the London inter-bank market, franc will be available at 7.0550 7110 7100. So, when you sell us dollar, you will get less franc. So, FRF will be available to you less, the less amount is here 7.0550, that will be available to you.

Now US dollar in London inter-bank market will be one US dollar is equal to FRF 7.0550. Now, the US dollar actually, if you integrate the London market and US market, London market and Bombay market, then you will get a direct quote for the cross the

currency, or the direct quote for franc and Indian rupee. So, in US dollar in London Bombay cost RS 53.26, and in franc value, it will be French franc value, it will be 7.0550, so that means, if you see in this way; that means, rupees 53.26 is equivalent to FRF 7.0550.

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### Cross Exchange Rate

- To purchase US\$ we need to surrender more rupee  
 $US\$1 = Rs.53.2600$
- When we surrender US\$ we would get less FRF  
 $US\$1 = FRF 7.0550$
- Cross Exchange between Rs and FRF would be  
 $US\$1 = FRF 7.0550 = Rs.53.2600 \quad FRF1 = 7.5493$

#### Example:

If exchange rates in Mumbai inter-bank market is  $US\$1 = Rs.55.2050/2100$  and in London inter-bank market is  $Euro1 = US\$ 1.2740 /2745$ . What would be the exchange rates between Indian Rupee and Euro.



In other word, if you see the exchange rate, other word in other word, one franc FRF 1 will be, you have to divide 53.2600 by 7.050, it will give us 7.5493 FRF. So, actual market, the Indian rupee will be in Indian rupee term, Indian rupee term. So, FRF will be, 1 FRF will be rupees 7.5493. This is the calculation of FRF; we have migrated cross currency way; that means, since direct quote is not available Indian, between Indian rupee and French franc. We are purchasing US dollar, in Indian Bombay offer inter-bank market, then you are migrating London inter-bank market, selling US dollar to get franc, and then you convert between franc and Indian rupee, the valuation side. So, one franc will be 7.54 93 paisa. So, this will be the exchange rate calculation what is called cross currency calculation rate. So, the answer is here, here you can see that answer. So, we are purchasing US dollar at 53 26 in London Bombay inter-bank market, then you are going to the London inter-bank market, there you are surrendering US dollar and getting a franc of 7.0550, and this exchange rate takes place between Indian rupee and French franc in this same way.

So, one US dollar will be 7.050, and it will be 753.26 rupees. So, one frank will be 7.5493 rupees. This is the one, this is the way of cross currency exchange rate takes place. Now, let us do the second example, here second example is the if exchange rate in Bombay inter-bank market is US dollar 1 is 55.2050 and 2110, and in London inter-bank market it is 1 euro is, 1.2740 and 2745 what will be the exchange rate between Indian rupee and euro. Here also same problem, since in Indian market we are not getting a direct quote between Indian rupee and euro. So, you have to migrate from Bombay inter-bank market to London inter-bank market, to decide the exchange rate between euro India and Indian rupee. So, when you have, we have only within our hand Indian rupee, you want to purchase euro. Since in India direct quote for euro and Indian rupee is not available, we are purchasing dollar from Bombay market, selling the dollar in London market to get the euro. So, we have Indian rupee, so you want to purchase dollar.

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Mumbai Inter bank  
 $US\$1 = \text{Rs. } 55.2100$

London Inter-bank  
 $\text{Euro}1 = \text{US\$} 1.2745$

$\text{Euro}1 = \text{US\$} 1.2745 \times 55.2100$   
 $= \text{Rs. } 1.2745 \times 55.2100$   
 $= \text{Rs. } 70.3652$

So, in Bombay inter-bank market same thing, we have to do, in Bombay inter-bank market. So, for us we are purchasing dollar you have to surrender more rupees, the rupee will be 55.2100. So, if you surrender 55.2100, then you get one dollar in Bombay inter-bank market, then you have to go to London inter-bank market. London inter-bank market, you are selling US dollar and getting euro, so, but euro is available at, one euro is costing how much, US dollar 1.2745, because in London inter-bank market, you have to purchase euro, when you want to purchase euro, you have to surrender more dollar. So, by surrendering 1.2745 we are getting one euro, so 1.2745 is equivalent to one euro.

So, however, when you calculate the Indian rupee euro to one euro, one euro will be US dollar 1.2745 in London market, and one dollar is equivalent to in Indian market, one dollar is 55.210.

So, other way 1.2745 into 55.2100 will give you the, what is the cost of one euro in Indian rupee, because for us one dollar is 55.2100, and one euro is 1.2745 US dollar. So, 1.2745 US dollar is equivalent to how much rupee that you have to purchase. Since one rupee is, one dollar is 55.2110. So, you have to multiply 1.2745 US into 55.21, you will get the rupee equivalent of one euro. So, this will be something around 70.3652. So, what we solve the problem, we are purchasing US dollar from Indian market, and paying, how much you surrender rupee 55.2100, and you are going to London market, purchasing euro by surrendering 1.2745 US dollar. So, one euro will be 1.2745 US dollar, and one US dollar is 55.21, we are multiplying these two, and this will give you rupee equivalent of one euro, and that one euro is 70.3652.

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## Cross Exchange Rate

- **Transaction Process**

- Purchase US\$ in Mumbai Inter-bank market by surrendering INR.
- Purchase Euro in London Inter-bank market by surrendering US\$.
- Mumbai inter-bank market US\$1=Rs.55.2100
- London inter-bank market:Euro1= US\$ 1.2745
- Cross exchange rate:  
Euro1= 1.2745\*Rs.55.2100 =Rs.70.3652



You see here, we have done in same way; the transaction process takes place in purchase US dollar in Bombay inter-bank market, by surrendering INR, then purchasing euro in London inter-bank market, by surrendering US dollar. So, Bombay inter-bank market dollar will be available to us as 55.210, and London inter-bank market one euro will cost 1.2745. The cross exchange rate takes place between one euro is equal to 1.2745 into 55.

So, we are getting rupee equivalent of 1 euro is 70 rupees 36 52 paisa. So, that is called cross currency exchange rate between euro and Indian rupee.

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### Forward Exchange Rates

- Exchange rate for settlement beyond the spot date is called “*Forward Rate*”.
- Forward price is estimated by adding/deducting forward points on spot rate.
- Forward price is higher than spot price the currency is said to be at a premium. Forward price is lower than spot price the currency is said to be at a discount.
- Under direct quote, for appreciating currency, the forward point is added and for depreciating currency, the forward point is deducted from the spot price.
- In case of direct quote
  - Forward Price = Spot Price + Premium ( -ve Discount)
- In case of indirect quote
  - Forward Price = Spot Price - Premium ( +ve Discount)



Now, this is what you estimate here, what is called as spot market rate. Spot market rate between direct quote and also between indirect quote, what is called direct quote for direct availability of two market, and cross currency between three currency involved, to calculate the two currency exchange rate, but in actual transaction in foreign currency market also takes place forward; that is after two months, after three months what will be the exchange rate, that also available in the different foreign currency market. The question is, we discussed earlier session that exchange rate for settlement beyond the spot rate is called forward rate.

After two days, any exchange settlement takes place, it is called forward rate. So, forward rate is estimated by adding forward premium to spot rate, when spot rate is available up to two days, beyond two days you want foreign currency, then you have to go to the forward market rate. And forward market rate decide the rate, by adding either addition or deduction some points in the spot rate, so that will be the forward rate. So, forward market is, forward market rate may be a currency may be a premium currency, or a currency may be a, what is called a discount currency. So, if the spot rate, the forward price is higher than the spot price, forward price is higher than the spot price, it



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Nov 2012  
Mumbai inter-bank  
 Spot: US\$1 = Rs. 53.2550/2600  
 Dec-12 25/30  
 Jan-13 40/50  
 Feb-13 75/85  
 Spot: Nov-12 US\$1 = Rs. 53.2550 - 53.2600  
 Forward Dec-12  $\frac{0.0025}{53.2575} - \frac{0.0030}{53.2630}$

That is Bombay inter-bank market, Bombay inter-bank market, US dollar is quoted as 53.2550 and 26, what does it mean. It means that you want to purchase US dollar, then it will be 53.26, you want to sell US dollar you get 53.2550. Now, in this is a foreign spot rate, spot rate spot market rate during the month of November. Now suppose the forward points are given to you, forward points for December, we will be discussing about December forward point is 25 30. January forward point is January 2013 forward point is 40 50, and also February, January 13, February 13, December 12. So, February 13 forward point is 75 85. So, now you have to calculate what will be the forward buying and selling rate of US dollar and Indian rupee, in different month.

Suppose what does it mean, it means that we have November month 2012 November spot rate, and want to estimate what will be the rate of US dollar and Indian rupee in December 2012, January 2013 and February 2013. So, but what we have given, what the question is given to us. The question is given to us, the forward point between in November, December, January and February. So, you have to read the forward point first. Here the forward point is December month forward point is 25 30, what does it mean 25 30. First number 25, second number is 30; that means, rupee is depreciating against US dollar; first number is second number is higher than the first the market rates, the rupee depreciate in December 2012. Similarly, January 2013, 4050, similarly first number is 40, second number is 50. So, 50 is more than 40 here, so rupee is further depreciating in the month of January.

Similarly, in February 75 85, rupee also depreciating in place of, against the US dollar. Suppose you want to estimate the spot rate in month of December, so what you do. Spot rate in November 2012, so for US dollar 53.2550 and 53.2600, this is you want to purchase US dollar, you have to pay this much, and to sell US dollar you get this much. Now we want to calculate the forward rate December 2012. So, here the forward points are given to us 25 30; that means, 25 30, first November is lower second number is higher, rupee is depreciating against US dollar; that means, US dollar is a appreciated currency, rupee is a depreciated currency, then what you have to do that. Since you know the forward point, so in December 2013 what you will do, you have to add this forward point. So, 25 here 0025, and here 30, so here 00030.

So, what will be this, this is 575253 53.2575. Here 53.2630; that means, in month of December, the bank will give you a forward rate. Suppose you want you go to the bank, and ask for a forward point for the November for the December 2012, bank will give a quote 53.2575 and 53.2630; that means, you want to purchase US dollar for December 2012, then you will have to pay 53.2630. You want to sell US dollar for December 2012, you have to get a rupee of 53.2575. This is December month forward, the forward rate, November month spot rate, at November month you know the rate, but December you do not know the rate, but you know only the forward point, you can calculate December month forward rate. The forward rate is 53.2575 for selling US dollar, and for purchasing US dollar 53.2630. So, this is called the forward point, forward rate for December.

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Forward Jan-2013 40/50

Spot NOV 53.2550 — 53.2600

January 2013 Forward Rate 0.0040 — 0.0050

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53.2590 — 53.2650

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Feb-2013 NOV-12 spot 53.2550 — 53.2600

Feb Forward 75/85 0.0075 — 0.0085

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53.2725 — 53.2685

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Suppose, you want to calculate again for the month of forward rate, for January 2013, January 2013 the forward point is available to you, the forward point for January is 40 50, and spot rate November is 53.25 50 and 53.26. So, since the January is 40 50, so. So, US dollar is appreciating, rupee is depreciating why, the 50 is more than 40. So, you have to add, now you have to add the forward point. So, now, you add the forward point for calculation of January month, January 2013 forward rate will be 0.0040, here 0.0050, you calculate this, then you will get the 53 here 20 590 here 53 53.2650. So, this is the forward rate for January month. So, buying rate of US dollar is 53. 26 50 selling rate for US dollar is 25 90.

Now, similarly for February month, February 2013. So, spot reach November month, November spot, November 2000 spot is given to you, the spot is 53.2550 and 53.2660, and February forward point, February forward point is available to you was, is 7585, that is also appreciating depreciating, rupee is depreciating. So, you have to add the forward point here 85, then you will get 5272 53.2725, and here 58262 53.26 26, you see that rate here, calculation is here January you are adding here, 53. 2675 2685.

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### Forward Rates Quotations

	<b>Selling Rate</b>	<b>Buying Rate</b>
Spot US\$1	53.2550	53.2600
December	0.0025	0.0030
	<b>53.2575</b>	<b>53.2630</b>

	<b>Selling Rate</b>	<b>Buying Rate</b>
Spot US\$1	53.2550	53.2600
January	0.0040	0.0050
	<b>53.2590</b>	<b>53.2650</b>

	<b>Selling Rate</b>	<b>Buying Rate</b>
Spot US\$1	53.2550	53.2600
February	0.0075	0.0085
	<b>53.2625</b>	<b>53.2685</b>

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So, this is a calculation of forward point. Now you see the answer is here for the month of December, the spot rate is 53. 25; that is, selling rate half dollar, and buying US dollar is 53. 26. So, we are adding the spot; that is your forward premium, since is 25 is less than 30, so rupee depreciating we add the forward premium. So, we are adding 0.0025,

we are getting 53.25 75 with the buying selling rate of US dollar. Similarly you are adding 30 here. So, we are getting 53. 26 30 is a buying of buying of US dollar. Similarly, in the case of January month, January the forward point is 40 and 50. So, it is rupee depreciating here.

So, you are adding on the spot rate, similar 53.25 50 add 0.40 you are getting 53 25 90, it is the selling of US dollar, and similarly here also 53 26 50 it is the buying of the US dollar. In the month of February similarly 75 85 are the forward rate, forward points. So, since the 75 is less than 85, rupee is depreciating. So, we are adding the forward premium here, and you are getting 53 26 25 is the selling of US dollar, and 53.2685 is the buying of US dollar. So, what you understand from here, from the spot rate it is possible to calculate the forward rate. How to calculate the forward rate, on the basis of availability you have forward premium. When a currency is depreciating, forward premiums are added. When currency is appreciating, forward premiums are deducted from the spot rate. In this, by adding or deducting the forward premium, as per the premium discount we can calculate or estimate the forward rate.

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### Forward Rates Quotations

- Example:  
**In the inter-bank market rupee is quoted for November 2012 as**  
 Spot : Euro1 = Rs.70.2550 - 70.2600  
 Forward Points :     December : 25 – 30  
   January : 20 – 10  
   February: 15 – 10  
**Calculate the forward buying and selling of Euro / Rs.**

**Answer**

- Spot rate for November month is given as
  - Buying Rate Euro1 = Rs.70.2600
  - Selling Rate Euro1 = Rs.70.2550
- Forward points are given for the next three months.
- The forward points are in ascending for December, hence the base currency Euro is at a premium for December.
- For other months, the forward points are in descending, hence the base currency Euro is at a discount.

For premium currency forward points would be added for discount  
 currency forward points would be deducted.



In actual market forward rates are available for nearly one year though. Let us do a another example. Here the example is, in the inter-bank market rupee is quoted as one euro is a 70.2500; that is a selling of euro, and buying of euro 70.266. Now forward points are available December 25 30, January 20 10, and February 25 10. Now, we

calculate the buying and selling rate of euro here. So, buying rate of euro is, we want to buy euro, then you have to surrender more rupee; that will be 70 26. You want to sell euro then you will get less rupee from the bankers. So, it will be 70 25 26 25 50. Now how to estimate the forward rate, from the spot rate you have to add it.

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Spot Euro 1 = 70.2550 - 70.2600

Forward point  
Dec - 25-30

Forward Rate Dec - 
$$\begin{array}{r} 70.2550 - 70.2600 \\ 0.0025 - 0.0030 \\ \hline 70.2575 - 70.2620 \end{array}$$

January  
Forward point - 20-10

Spot: 70.2550 - 70.2600

January FR 
$$\begin{array}{r} - 0.0020 - 0.0010 \\ \hline 70.2530 - 70.2590 \end{array}$$

Now, spot rate is, similarly spot rate of euro in Indian market is, 1 euro is equal to 70.2550 and 70.2600. Now, you have to calculate December month, you have to calculate the December month. December month if you see, the December month forward premium, forward point month of December, December month forward premium is a, forward rate is available, or a forward point is 25 30. Then how we will read the currency, since 30 is more than 25. So, rupee will be depreciated in the month of December. Now, for depreciating currency because 30 is more than 25. So, rupee is depreciating. So, for depreciating currency, forward premium will be added. So, December month foreign forward rate, forward rate December will be 70.25 50 and 70.2600.

Now we have to add the forward premium here, 25 and similarly 0.0030 add here, now we will get 70.2575 here 70.2630 is the buying and selling of US dollar euro. You want to purchase euro in during the month of December, then you have to pay 70.2630. You want to buy US euro, then to sell euro in the month of December, you will get 70.2575 rupee. So, this is called December month forward rate. Like similarly in the

January month, January month if you see is that, January month, during the month of January, the forward rate forward point, you read the forward point from the January, the forward point is 20 10. Now you see 10 is less than 20, so in during the month of January, rupee appreciating against the euro, because 10 is less than first number, second number is less than first number; that is a market way of, what is quoting the forward premium. So, market quote the forward premium 20 10, what does it mean.

It means that 10 is less than 20, the second number is less than first number, then market expecting rupee will be appreciated during the month of January. So, for appreciating currency, the forward premium is deducted. So, in the spot rate, the spot rate is, euro of spot rate is how much, euro of spot rate; spot rate 70.2550 and 70.2600 and for the January; January forward rate will be 0 point, it will be minus 0.00 20 0.0010 simply minus, now it will be 70.2530 and 70 point, if you see it will be 2590. So, now since currency is appreciating, rupee is appreciating during the month of January against the euro, now against the spot rate, you are getting the forward rate from January less. So, now you want to purchase euro, then you have to surrender 70.2590 during January. You want to sell euro you will get 70.2530 in January.

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### Forward Rates Quotations

	<b>Selling Rate</b>	<b>Buying Rate</b>
Spot US\$1	70.2550	70.2600
December	0.0025	0.0030
	<b>70.2575</b>	<b>70.2630</b>
	<b>Selling Rate</b>	<b>Buying Rate</b>
Spot US\$1	70.2550	70.2600
January	-0.0020	-0.0010
	<b>70.2530</b>	<b>70.2590</b>
	<b>Selling Rate</b>	<b>Buying Rate</b>
Spot US\$1	70.2550	70.2600
February	-0.0015	-0.0010
	<b>70.2535</b>	<b>70.2590</b>



Similarly here we have calculated, you see the calculation process. In the month of February similarly rupee is appreciating, we are the forward premiums are deducted from the spot rate. Here we are getting selling rate of dollar, selling rate of euro 70. 2535 and

buying rate of euro 70.2590 in case of February month, February month against the November month. So, what you understand here, in case of similarly, in case of buying and selling of forward, buying and selling of any currency, forward depends upon the premium discount premium, premium is added if the currency is directly quote, premium is deducted if the currency is appreciating.

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### Determinants of Forward Points

- Market participants take forward positions as per the demand in the market. Hence, supply and demand for the currency for settlement date determines the forward points.
- Interest rate differentials between the currencies in exchange, is generally considered as the prime determinant of forward points.

#### Example:

In the inter-bank market rupee is quoted for November 2012 as Spot : US\$1 = Rs.53.2550 - 53.2600. If the interest rate in USA is 4% and in India it is 8%, what would be the arbitrage opportunity. What would be the one year forward point so as to remove any arbitrage.



So, the question is, how we got the forward points 25 30 or 24 40 50 whatever the forward premium, from where you got it. So, which are the determinants of forward points in the market. So, if you see market participant take forward position as per the demand in the currency. So, forward premium depends upon the position in the market, who takes the position. The exporter, importer at the market participant, on the basis of their expectation, the forward premium also determined, and primarily demand and supply interest rate differential at the two major variables or major determinants of forward premium. So, in actual calculation process we do not very difficult to understand, or very difficult to detect what is their position in the market. Position means, how much demand the exporter importers have, exporters supply dollar or foreign currency, importer demand foreign currency. So, how much demand, how much supplies are there very difficult to decide. However, the one variable which generally influence forward point, it is the interest rate, interest rate between two currency or two countries.

In case of US dollar in India what is the short, very short term interest rate in India, what is the very short term interest rate in US, they are decide the forward point, because if rupees is depreciating, then people will borrow from the US market and sell in Indian market. A rupee depreciating, again the US dollar then people borrow from Indian market and sell in US market. In this way, they take the arbitrage profit. So, interest rate differential is the primary variable in determining the forward points. Now if you do a problem then you will understand how interest rate decides the forward points. Let us discuss about the inter-bank market rupee is quoted for November. You see the example here; the inter-bank market rupee is quoted for November 2012 as this much 53.2550 53.26, if the interest rate in US is 4 percent, and in India it is 8 percent, what would be the arbitrage opportunity, what would be the one year forward point. So, as to remove any arbitrage, what we have got it, we have given here two things; first thing the spot rate.

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$$US \$ 1 = 53.2550 - 53.2600$$

USA - interest rate 4% } differential  
 India - interest rate 8% } (4%)

Borrowing US\$ 100.	₹ 800
Interest paid 4%.	₹ 8
End of year - \$104	\$108

$$108 \times 53.2550 = 5752$$

$$\$ 104 = ₹ 5752 \quad US \$ 1 = \frac{5752}{104}$$

$$US \$ \left( \frac{5752}{104} \right) = ₹ 55.3033$$

Spot rate of November 12, the November 12 spot rate is one dollar is equal to 53.2550 and 53.26. And in US the interest rate is 4 percent, and in India interest rate is 8 percent, and since the US dollar Indian rupee is getting quoted in India as one dollar is equal to 53.2550 and 53.2600. Now, we have got the two interest rate differential, if you see the interest rate differential between India and US, the differential interest rate is 4 percent. Now what does it mean, since in US the borrowing rate is less compared to in India, people borrow from US and sell in India. In this case, in India they will they will get 8

percent, but they have to repay 4 percent in US. So, there is a interest rate differential of 4 percent, this 4 percent they get the profit. So, interest rate differential of 4 percent, they get the profit.

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## Determinants of Forward Points

Borrowed US\$	100
US\$ Buying Rate	53.2600
US\$ Selling Rate	53.2550
Cost of US\$	4%
Interest Cost (US\$)	4
Repayment in US\$	104
Interest rate in India	8%
Interest earned in India	8
Total US\$ in India	108
Rupee Equivalent	5752
Arbitrage Amount (US\$)	4
For no arbitrage US\$1	55.3033
(Rs. 5752/US\$104)	



Now, question, suppose let us take a hypothetical example, like we are borrowing 100 dollars, 100 US dollars from the US market. So, 100 US dollar you have to borrow from US market. So, borrowing US 100 dollars, so how much interest you have to pay in US, interest payment, interest need to be paid 4 percent; that is 4 dollar. So, end of one year, end of year one, we are paying how much, we are paying 100 dollar principal and 4 dollar interest. So, 104, we are paying 104 dollar end of one year in US. Now, what you will do if this 100 dollar, you are coming to India now. So, India, interest rate is 8 percent, so we will get in India 8 percent for 100 dollar in India. So, in India 100 dollar we will add 8 dollar, 100 dollar and 8 dollars, and interest on an end of the one year, end of one year we have in India, dollar amount 108.

The interest in India we borrow the 100 dollars, and you paid interest, earn interest 88 dollar. So, end of the year one you are also end with 108 dollars. So, end of one year you have to repay 104 dollar to the US market, but Indian market we got 108 dollars, so there is a profit of 4 dollars, this 4 dollars profit is there. So, now, question is here, this 108 dollar is equivalent of how much money, how much Indian rupee, because 100 and

dollar 108 dollar we have. So, 108 dollar we will sell in the market, Indian market how much rupee we will get, because you are surrendering dollar in Indian market.

So, you will get less rupee, so you will get this much of rupees. So, the rupee equivalent of 108 dollar will be 108 into per dollar, if you give it to bank, bank will give you 53.25 50. So, 53.25 because bank will give you always less, so this much of rupees you get. This is equivalent to how much, if you multiply these this will be 57 52, this much of rupee you got it. This much of rupee we got extra, this much of rupee you got it. So, but your, the arbitrage opportunity is 4 dollar here, but we have got 57 52. Now, question is this 57 52 equivalent to how much, if equivalent to 100 and 4 dollar, then there will be no arbitrage. If this amount 57 52 in Indian rupee is equivalent to 104 dollar, there is no arbitrage, because arbitrage available because why, the 4 percent interest rate differentials are there.

If there is no 4 percent interest rate differential, there will be no arbitrage the 4 percent is nothing, but this two, 100 and dollar of 100 and 4 is equivalent to rupee 57 52, then there will be no arbitrage opportunity. Then what will be the cost of US dollar. The cost of US dollar is nothing, but 5752 divided by 104; that will be the cost of US dollar, and this will be nothing, but if you calculate these, this will be nothing, but how much. The US dollar will be equivalent to 57 52 by 104 is equivalent to 55.3033. So, what does it mean, it means that, if end of one year the rupee is available at 55 dollar is available at 55.3033 there will be no arbitrage opportunity; that means, the you have to, the interest rate differential should reflect in the forward rate premium. So, in this example what we learnt. The learning part is here, interest rate differential provides a avenue for inflow of dollar to a particular country, where interest rate arbitrage opportunity is available.

So, in case here, the US has a 4 percent interest rate, India has 8 percent interest rate, India having more interest rate, there is a interest rate differential of 4 percent, dollar will migrate to India why. People will purchase borrow dollar from US market at 4 percent. Send to India and get the opportunity of 4 percent interest rate differential; that will be a vehicle, that will be incentive for the flow of dollar from US to India, and this 4 percent differential is a arbitrage opportunity available. However, if the market, if the forward premium or the market decides that there is a arbitrage opportunity, everybody borrow from US and sell in India, then arbitrage opportunity is reduced, and slowly the interest rate is. The dollar value of rupee will migrate it to 55.33, where there will be no arbitrage

opportunity between India and US. The arbitrage opportunity provides, the basic avenue for the movement of dollar from one country to another country.

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### Interest rate Differential & Forward Points

Forward Points = 
$$\frac{\text{Spot rate} * \text{Int.Diff} * \text{Forward Period}}{100 * 360}$$

**Example:**  
In the inter-bank market rupee is quoted for November 2012 as Spot : US\$1 = Rs.53.2550 - 53.2600. If the interest rate in USA is 4% and in India it is 8%, what would be the arbitrage opportunity. What would be the one year forward point so as to remove any arbitrage.

**Answer:** Spot rate: Rs.53.2600,  
Interest Rate Differential : 8%-4% = 4%  
Forward Period: 360 days  
Forward Points: 2.13  
1 year Forward Rate = 53.2550+2.13 =Rs.55.3852

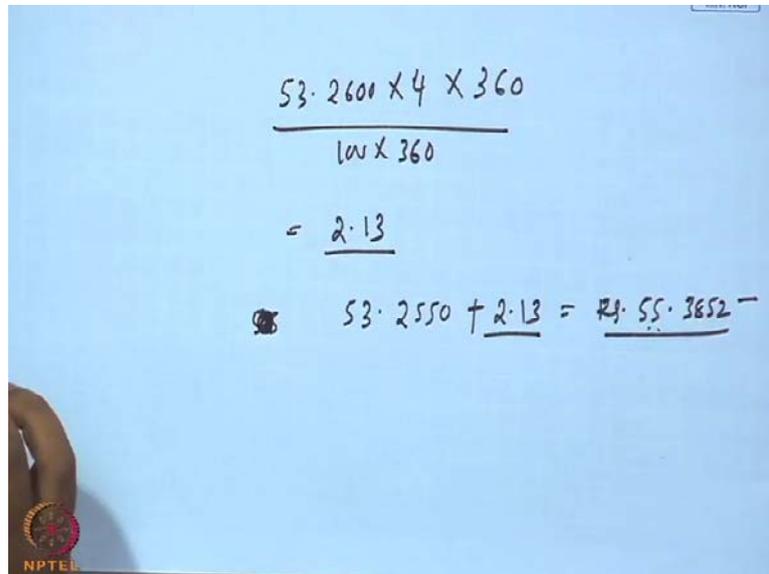


Now, the question is here what you have learnt. The interest forward point, how to estimate the forward point, as I mentioned you mention that, interest rate differential is the primary variable for the movement of dollar, for the movement of forward point. So, interest rate differential decide the forward point. When you know the interest rate differential, you can calculate the forward point. What is the formula here, the formula is here a forward point is nothing, but spot rate into interest rate differential into forward period, how many month; 1 month 2 month 3 month. In our earlier example it is one year, so it is 365 and divide by 100 into 360. 360 is here because in actual foreign exchange market, the transaction takes place for 360, despite being a 24 hour 3 year, entire year market and there are 5 holidays in the market, and that 5 holidays market generally closed, and we take into account only 360 days for calculation of foreign exchange.

So, forward point is spot rate into interest rate differential into forward period divided by 100 into 360. If you use this formula for our earlier example, our spot rate was how much, if you see our earlier example our spot rate is 53.26, and interest rate differential is 4 percent and forward period, since it is one year 360, the forward point if you calculate this interest rate differential spot rate is 53.266, and our interest rate differential is 4, and

our entire is one year calculation 360 divided by hundred into 360, this will give you the forward premium of 2.13.

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$$\frac{53.2600 \times 4 \times 360}{100 \times 360}$$
$$= 2.13$$
$$53.2550 + 2.13 = 55.3852$$

And spot rate, purchase of dollar is 53.2550 plus that 2.13, if you add these, this will give you rupee equivalent of the forward rate for one year is 55.3852. Here, when you have dollar you will sell dollar for 53.2550, and you have a forward premium, forward point you are adding here 2.13, this will give you 55.3852. In our earlier example if you see, our earlier example we have calculated, our earlier example we have calculated 55.3033 the forward rate, but we got 55.3852. The differential is here, here interest rate is calculated for 365 days, here interest rate is calculated for 360 days. So, there is a differential problem for adjustment problems are there. So, once you know the interest rate differential, if you know the forward spot rate, then automatically for any period, for any days, for any you can calculate the forward point, through the interest rate differential calculation process. So, once you know the interest rate differential and the spot rate, you can estimate the forward point. Once you know the forward point, you can estimate the forward exchange rate for any period.



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Mumbai

$$\begin{array}{r} \text{Spot US\$1} = 53.5000 \\ - \quad 0.0015 \\ \hline \text{US\$1} = \underline{53.4985} \end{array}$$

London

$$\begin{array}{r} \text{Euro1} = \text{US\$ } 1.2750 \\ + \quad 0050 \\ \hline \text{US\$ } 1.2810 \end{array}$$
$$\text{Euro1} = \text{US\$ } 1.2810 \times 53.4985 = \text{Rs. } 68.4781$$

So, in the Bombay market, the Bombay market, in Bombay you have to purchase dollar. So, spot rate will be one dollar is equal to 53.5000, and since it is a three month, three month if you see three month forward premium will be 2015, third month forward premium is given here 2015, 2015 means second one is less than the first one. So, rupee is appreciating here, so you have to rupee is appreciating you have to minus or deduct the forward premium. So, minus forward premium less, so 0.0015, so we got 000.0.0 you have got the rupee is appreciating here, rupee is appreciating we are misusing it.

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### Forward Cross Exchange Rates

#### Answer

- From Mumbai market we have to purchase US\$
- Adjust the US\$ for 3 month forward
- Purchase Euro in London Market against US\$
- Adjust the Euro for 3 month forward

In Mumbai inter-bank market US\$ purchase spot basis the rate is  
US\$1 = Rs.53.5000

3 month forward points: 15 ( Rupee is appreciating, hence discount)

3-month Forward exchange rate: US\$1 = Rs.53.4985

In London inter-bank market Euro purchase spot basis the rate is  
Euro1 = US\$ 1.2750

3 month forward points: 50 ( US\$ is depreciating)

3-month Forward exchange rate: Euro1 = US\$ 1.2800



Hence Euro 1 = Rs.53.4985 \* 1.2800 = Rs.68.4781

So, we got 53.4985 as the rupee after three months; that is dollar equivalent of rupee after three months, one dollar after three months will be quoted at 53.4985. Now, once you got the dollar rupee after three months rate, then you go to the London market. In the London market you want to purchase euro; that means, you have to surrender more dollar. So, you have to surrender more dollar, one dollar will be, one euro will be costing you in the London market, euro will be costing you how much; US dollar 1.2750. And if you see the forward premium, three month forward premium, 3 month forward premium in London market third month 45 50, third month 45 50; that means, London market euro is appreciating, euro is appreciating dollar is depreciating, you have to add the forward premium. Now, you have to add the forward premium 0050 here, it will be becoming 182, so US dollar 1.2810. Now, US dollar after three months euro will be this much, after three month dollar will be this much in London market in Indian market. So, what will be the equivalent calculation. The calculation will be here, so what will be that. Now one euro will be after three months USD 1.2810 into the one dollar will be 53. So, 53.4985 this will give you something around rupee amount of 68 point some, we multiply this two we will get the rupee amount of 68. 4781, rupee amount of one euro, so the euro calculation will be in two way or cross currency forward rate calculation is like that.

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## Forward Cross Exchange Rates

- **Example:**

An exporter in Kolkata has exported goods to London and has drawn a bill of exchange in £ payable on Sept 30. He approaches his bank on July 1 for purchase of the export bill. What rate the bank will quote if spot rates in July 1 are as follows:

**Mumbai Market: Spot US\$1 = Rs.53.4550 – 53.5000**

**Forwards : Sept : 45/25**

**London Market: Spot £ 1 = US\$ 1.5745 – 1.5750**

**Forwards : Sept : 55/50**



So, similarly you can do this example. In Kolkata a exporter in Kolkata exported goods drawn bill of exchange in pound sterling, payable on September 30. He approaches his

bank in July and purchases this export bill. What rate bank will quote that. Here also two way market, in India we get the dollar and rupee quotation, in London you get a pound sterling and dollar quotation. Similarly in forward premiums are available two market, you have to calculate this in a similar fashion what you discussed.

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## Forward Cross Exchange Rates

### Answer

In Mumbai inter-bank market US\$ purchase spot basis the rate is

US\$1 = Rs.53.5000

Sept. month forward points: 25 ( Rupee is appreciating, hence discount)

Sept-month Forward exchange rate: US\$1 = Rs.53.4975

In London inter-bank market £ purchase spot basis the rate is

£ 1= US\$ 1.5750

Sept. month forward points: 50 ( US\$ is appreciating)

3-month Forward exchange rate: £ 1= US\$ 1.5250

Hence £ 1= Rs.53.4975 \* 1.5250 = Rs.81.5837



The answer here, the Bombay inter-bank market purchase of dollar will be 53.5050, and September forward point 25, rupee is appreciating in forward premium will be deducted, so 53.4975. In the London inter-bank market, pound sterling spot basis will be 1.5750 dollar. So, September month 50 point, dollar is appreciating the pound, the three month forward exchange rate will be, the three month forward premium will be deducted. So, we got the after 3 month forward exchange rate will be, one pound sterling will be 1.5250. And once you got the pound sterling, the rupee equivalent the 1.5250 is the dollar rate, and per dollar the amount of rupee will 53.4590. If you multiply these then you will get the rupee equivalent of pound sterling, then what is the after three months, pound sterling, one pound sterling will be 81. 58 53737 rupees. once you.

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## References

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So, these are the references you can go through that, and small questions are available to you.

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## Model Questions

1. A depreciation of the INR refers to a (an):
  - a) Fall in the INR price of foreign currency
  - b) Increase in the INR price of foreign currency
  - c) Loss of foreign-exchange reserves for the India.
  - d) None of these
- 2) If USDINR rate is 45.17 and USDJPY is 112.35, what would be JPYINR rate?
  - a) 2.4872
  - b) 0.0310
  - c) 0.40204
  - d) 32.217
3. A Canadian Exporter exporting goods to USA will receive USD100,000 after 3 months. A bank quotes 3-month USD- CAD forward bid -ask rate as (1.2302 – 1.2315). How much the Canadian exporter will receive if he enters the forward contract?



The multiple one question, a rupee a depreciation of INR refers to what, when INR or rupee depreciating; that means, a fall in INR price of exchange foreign currency, or it increase a INR price of foreign currency. The rupee depreciating rupee today is 53 and tomorrow it is 54, then rupee is depreciating, foreign currency value will appreciate, so this you can increase INR price of foreign currency. Similarly in the second question you

have given USD and INR conversion rate, and USD Japanese conversion rate. You have to calculate the Japanese then INR cross currency exchange rate. Here you have to follow the cross currency exchange rate and calculate that, you have to calculate the exchange rate.

Third question is, Canadian exporter exporting goods to US will receive one lakh US dollar after 3 month. The quote for 3 month Canadian US dollar is available to you, and how much the Canadian exporter will receive in terms of, in a forward contract. Here forward contract the Canadian the person is having dollar, will sell dollar in the Canadian market, so you will get less amount of Canadian dollar. So, the exchange rate will be 1.2302, you multiply 1.2302 with the 1 lakh USD you will get the export rate amount, export amount in terms of Canadian dollar, thank you. Next session we will be discussing continuing with the merchant rate, foreign exchange calculation side.