Interest Rate Futures – Products for Indian Market

By
Golaka C Nath

Interest rate derivatives have been widely used in international markets by banks, institutions, corporate sector and common investors. Like any derivative product, interest rate derivatives do provide risk hedging tools. As per the latest statistics released by Bank for International Settlement, the exchange traded volumes (notional turnover) in the derivatives products as of September 2002 is about US$ 435 trillion out of which a major portion comes from interest rate products. The OTC market for derivative is also huge and mostly in interest rate products though currency derivatives also constitute a sizeable portion. However, the statistics also tells us that the market is more active in Europe and US and very little activity is in Asian markets though Asian markets have a good presence in exchange traded equities. Table – 1 gives the outstanding size of the exchange-traded derivatives market in international markets.

Table : 1 Exchange Traded Derivatives Turvover

	Notional value(US$ billions)		Contracts (in million)
	2001	2002 (Sept)	2002(Sept)
Futures	446358	381954.5	1274.9
Interest rate	420934.2	359964.8	874.3
Currency	2499.3	1899.8	32.5
Equity	22924.5	20090.1	368.2
Options	148547.9	53574.9	1704.3
Interest rate	122765.9	114567.7	177.4
Currency	355.9	331	12.7
Equity	24426	26574.8	1514.1
Total	594905.9	435529.4	2921.2

Source: BIS Quarterly review

In India, IRSs/FRAs were introduced in June 1999 with a view to further deepening the money market as also to enable banks, PDs and FIs to hedge interest rate risks. The market for these derivatives, however, has not developed appreciably for lack of legal clarity. It is viewed in some circles that there is no suitable regulatory framework to govern trading of these derivatives. These are not derivatives under the Securities Contracts (Regulation) Act, 1956 as these are not derived from securities. However, these

products, if traded in exchanges can be covered under "contract for difference" provisions of SCRA giving it a regulatory sanction. However, an explicit clarification from regulators should cover the entities who can enter into such contracts, the broad parameters of such contracts, clearing corporation for settling these contracts, and a dispute resolution mechanism.

In India, derivatives products on equity and equity indices were introduced in the form of exchange-traded products and these products have established themselves in the market and there is a fair demand for such products and the market has been growing at a rapid pace. But the OTC derivative products on interest rate has not been highly successful in India as it remained outside the scope of exchanges due to some regulatory barriers. However, there has been encouraging activity in the interest swap market and the volume is believed to be around Rs.1,300,000 million though there are about 15 participants in the market. The main force of the banking industry in India, the public sector banks, have not actively participated in the IRS market and the FRA market remains very illiquid. Compared to this, the underlying bond market, specifically the Gilts market, has been very active and the volumes have been rapidly increasing. But the market has been confined to banks and institutions, though there has been always a case for retail debt market through stock exchange mode. The exchanges in India have introduced the retail debt trading with guarantee of settlement with effect from January 16, 2003. Given the significance of exchange-traded interest rate derivative products worldwide, a case exists to consider introducing the same in India to achieve further competitiveness in the fixed income securities market. The introduction of exchange traded debt derivative products in India will provide market participants another risk containment and diversification outlet while taking away the counterparty risk. The equity market experience would be coming very handy in introducing debt derivatives in India. To start with, it would be always safe to start with futures contracts and in a phase-wise manner, options can be introduced. The article concentrates on basic issues related in interest rate futures products.

Interest rate Futures

Interest rate futures are futures contracts based on interest rates. For example, the buyer (long) of a T-bills futures contract commits to buy a say 91-day T-bill with a certain face

value on some specified future date at a price negotiated at the time of the contract and the seller (short) agrees to deliver the same as per the contract. But if we look at both the buyer as well as the seller, what they are going to do with the physical T-bill of the contract on the expiry date. Possibly, the seller will buy it from the market and the buyer will in turn sell the same in the market or even if he holds, the same would be valued in terms of the market price in his books as on date. Hence they have recourse to the underlying market and a cash settled contract takes care of the same. Instead of physical delivery, the same is assumed to be sold or purchased in the underlying cash market in terms of the price existing at the expiry of the contract or the exercise of the contract. The cash settled futures contracts like Eurodollar futures has been highly successful. Hence, futures should be termed as contracts that are standardized and transferable and provide for exchange of cash flows based on market price of some security. A future contract need to be settled though a clearing house of an exchange or the clearing corporation which assumed the counter party risk. A party to a futures contract can always liquidate a futures commitment or open new position before maturity through an offsetting transaction. An exchange that provides a trading mechanism for trading in futures contracts also provides the specifications of traded contracts and regulates trading practices.

Any trade needs to result in settlement. And for settlement, the clearing corporations like NSCCL or the clearing house of an exchange plays an important role. The clearing corporation holds the clearing members responsible for any resulting losses for any failure of commitments of their clients. It also assigns settlement. The most important aspect is it provides a settlement guarantee. Since it provides guarantee, it needs to remain afloat for smooth conduct of the market and hence it follows stringent risk containment measures like margining. Margins can be in the form of initial deposits and or in the form of mark to market.

The practice of marking futures contracts to market requires all buyers and sellers to realize any gains or losses in the value of their futures positions at the end of each trading session, as if all positions have been liquidated at the closing price. The clearing corporation needs to collect such payments from all loss making members and transfer

the proceeds to all profit making members. Marking a futures contract to market has the effect of renegotiating the futures prices at the end of each trading session. Once the contract is marked to market, the trader begins the next trading session with a commitment to purchase the underlying item at the previous day's closing price.

At the expiry date, the spot and future prices should converge as there will be no time value involved in the contract. That means buying a futures contract or the expiry date is equivalent to buying the underlying in the cash market. Hence, a contract is marked to market one final time at the end of a contract's last trading session. The gross return on the futures position is reflected in accumulated total margin payments, which must equal the difference between the final settlement price and the futures price determined at the time of futures commitment was entered into. If the contract specifies for delivery of the underlying security, the clearing corporation subsequently makes arrangements for delivery of the same. Sometimes, the clearing corporation may also allow other deliverable securities to be delivered by a clearing member. When a particular bond is delivered, a parameter known as the conversion factor defines the price received by the party with the short position. Thus the cash received by the party with the short position is given by :

Cash received by the short = (Quoted futures price * Conversion factor for the bond delivered) + accrued interest on bond delivered.

The conversion factor for the bond delivered is calculated by calculating the price of the bond corresponding to its yield being equal to the nominal interest rate fixed as the interest rate for the instrument underlying the futures contract. The price is divided by the face value of the bond to calculate the conversion factor. For a bond future for which the nominal interest rate of the underlying instrument is 10%, the conversion factor is calculated by valuing the cash flows underlying the bond using a YTM of 10% and then dividing the price so calculated by 100. It would be always beneficial for the short to deliver the cheapest. Here the short receives the value equivalent to quoted futures price multiplied by conversion factor for the bond delivered plus the accrued interest on bond delivered while the cost of purchasing a bond is quoted price of the bond plus the accrued

interest. And the cheapest to deliver is one for which (quoted bond price – quoted future price)* conversion factor is the least.

Pricing T-bills Futures

Cash and carry arbitrage using T-bill futures involves the purchase of a T-bill that will mature say after 91 days. A cash and carry arbitrage operation can be viewed as an implicit reverse repo deal, which is a repurchase agreement from the viewpoint of the lender. In a reverse repo transaction, a security is purchased with a commitment of selling the same at some future date. It may be viewed as lending with the collateral of a security. Like a party to a reverse repo transaction, a trader who buys T-bill while selling a futures contract obtains temporary possession of the security while committing to sell it back at some future date. As the difference between the purchase price of a bill and the agreed-upon sale price determines the interest rate earned by a party to a reverse repo, the difference between the futures and the spot price determines the return to a cash and carry arbitrage operation. In essence, the trader lends money to the market earning the difference between the future delivery price and the price paid for the bond as implicit interest. The rate of return in this case is know as implicit repo rate. As a market practice, implied repo rate is expressed as the annualized rate of return that could be earned by buying a T-bill at a price *S(0)* at date 0 and simultaneously selling a futures contract for delivery at date T for a price *F(0,T)*. The formula is given as

IRR = {[F(0,T) – S(0)]/S(0)}*360/T where IRR is implied repo rate and the convention is expressing in terms of a 360-day year.

This can also be shown with the help of an example. Suppose we have 60 days to next delivery date of a T-bill futures on an amount of Rs.10,00,000. A security with 151 days left to maturity will have 91 days to maturity on the next futures delivery date and can be used to satisfy delivery requirements for the nearby futures contract. Is the current discount yield on a security with 151 days to maturity is 5.5%, the cash price of the security S(0) will be = 10,00,000 – 10,00,000*0.055*(151/360) = 976930.60

Now suppose the price of the nearby T-bill futures contract is Rs.98.00. A price of Rs.98.00 implies a futures discount yield of the nearby T-bill contract is 100 – 98 = 2%.

Since the deliverable bill will have 91 days to maturity, the future deliver price implied by this yield is F(0,60) = 10,00,000 – 10,00,000*0.055*(91/360) = 986097.20. The implied repo rate in this case is IRR = {986097.2 – 976930.60)/976930.6}* (360/60) =0.0563 or 5.63%.

The cost of carry pricing relation can also be used to show that the no-arbitrage price should equate the implied repo rate with the actual repo rate. Comparing implied repo rates would amount to comparing theoretical futures prices, as determined by cost of carry model, with actual futures prices. An implied repo rate above the actual repo rate for the comparable period would indicate that futures are relatively overpriced. Hence the arbitrage profit can also be made by a trader by borrowing money in the cash repo market and implicitly lending the money back out through a cash and carry arbitrage to earn the higher implied repo rate. Conversely, an implied repo rate below the actual rate would indicate that futures contracts are under-priced and hence traders would follow a reverse transaction. It would mean buying an under-priced futures contract and simultaneously entering into a reverse repurchase agreement to lend money into the cash repo market.

Products for the Indian Market

The issue here is to find out suitable products to be introduced in the market. There can be many types of products based on specific securities or on interest rate or an index comprising of selected bonds representing the market or a representative bond index. It would be little difficult to find market for contracts on short term papers like T-bills in India as the underlying market is very narrow and very few trades are executed on T-bills and at any point of time, we do not have sufficient amount of outstanding securities and the holdings are also not well spread out. So there may not be much of interest in contract on T-bills. The Government and the RBI may think of ways to increase the issuance sizes of T-bills from the present notified amounts. However, there are many individual bonds of maturities between 8 to 15 years that are trading with fair liquidity in the market and selecting some of the bonds for futures contracts on the basis of their liquidity would not be difficult. Many of these bonds also have been actively traded in the market during last

24 months. The Table-2 will give up an idea about the concentration of trades in various maturity buckets.

Table-2 Percentage of Trading Volume in %			
	Oct-02	Nov-02	Dec-02
Less than 3 years	2.20	2.25	2.07
3 to 8 years	10.90	8.82	6.67
8 to 12 years	46.91	42.01	36.89
Above 12 years	32.87	41.04	47.30
T-bills	2.03	1.61	2.03

Source: NSE

However, in above 12 years maturity bucket, we see more concentration in a paper maturing in 2017. In the time bucket of more than 8 years we have more than 84% of the total trading activity. So these idiosyncratic factors need to be taken into account while selecting a bond for the futures contract. And as the underlying market has improved liquidity today, we can have few bonds with well spread holdings that can be considered for futures trading. The consolidation of issues by reissuance also helped in increasing the liquidity in the bond market as the available stocks increased substantially. Today we have about 23 bonds in which outstanding issuance is more than Rs.100,000 million and these bonds are generally liquid.

Another product that can also be considered for the futures contracts is a well representative index or a benchmark synthetic security derived out of few most liquid bonds, the criteria of liquidity need to be spelled out. It may be a safer bet to consider introducing an representative index or a synthetic on the basis of a selected few bonds if we take into account the experience of the equity derivatives market. Today we have 3 popular indices available that are disseminated by JP Morgan, I-Sec and NSEIL. We need to keep in mind that the first two indices are calculated by market participants who may trade in the bond index futures and there may be a conflict of interest in using their indices for the future contract. The indices released by NSE are scientifically calculated off its successful product NSE ZCYC. Hence an index developed and maintained by an unbiased agency would possibly best serve the purpose if we consider introducing a product on indices. However, it would be required to make the indices dynamic and proper maintenance need to be done to ensure that it remains in sync with the market.

We have seen products on interest rates like swap rate or reference rates or the forward rates. In Indian market, OTC contracts like overnight index swaps (OIS) and MIFOR contracts have reasonable liquidity. Hence it may not be out of place to think of introducing a product on MIBOR or MIFOR, the most widely used reference rate in the market. As MIBOR and MIFOR is increasingly used by market participants, short term contracts on MIBOR/MIFOR futures would be welcomed by the market. A contract on reference interest rate is normally quoted as 100-Rate. If a trader wants to quote 5.46% for a contract, then he should quote the price as Rs.94.5400 for the contract. The illustration of a MIBOR contract is given below:

Suppose today is the first fixation of MIBOR at 5.46%. But a trader does not know what the rates are going to be for sure in next one month but he would like to take a view on the same and I feel the average fixation for next 30 days is going to be 5.39%. Then we can calculate the contract rate as below: Rate = (5.46*1 +5.39*30) / 31 = 5.3923% and I quote the Price = 100 – 5.3923 = 94.6077.

Suppose I enter the market 0n 9th January. Till 9th January, I have already 8 fixations (one being holiday and the fixations are 5.54, 5.49, 5.58, 5.67(Saturday), 5.47, 5.47, 5.49 and 5.45. The Saturday fixation would be considered for Sunday also. The average becomes: MIBOR till 9th = 5.5367 and for next 22 days our trader expects the average rate as 5.49 and hence he quotes the rate as follows: Rate = (5.5367*9 + 5.49*22) / 31 = 5.5036 which means Price = 100 – 5.5036 = 94.4974

Normally the exchange traded contracts are settled daily in terms of mark to market. Settlement may be done at the close price of the Futures contracts. Close price would be last 'n' minutes weighted average prices of the deals reported in the market. On expiration day the final settlement would be on the average MIBOR fixations for the month. The advantage is on the current month contract, the traders have already a known portion of the rate and other part is unknown which they are going to forecast before entering into the futures contract. This can be explained with the help of the following example: on 10th January SBI entered the market at 100 – 5.4375 = 94.5672 for January Contract expiring on January 31, 2003. On the day close the Futures market price is 94.6782. The position will be MTM at 94.6782 and the loss will be = 94.6782 – 94.5672

= 0.1110 per Rs.100 FV of contract. This has to be brought in by SBI and paid out to the bank that has made profit. And the Futures positions will be all marked to the base price of 94.6782 for 11th January 2003. On the final expiration all futures position outstanding on January 30th will be marked to the average MIBOR rate for the month and differences will be settled. On 31stJanuary, all the January contracts will expire. At any time we may have 12 contracts to give enough scope for hedging interest rate risk for one year.

A MIFOR contract will be priced and traded as given in the following example. This would enable people to take a view for, say, three/six/nine/twelve month rupee cost of a fully hedged dollar funding. The fundamentals behind the same is to borrow 1 dollar today (if the same is cheaper) and convert the same into Rupee at spot and invest the same at domestic rate and simultaneously enter into a forward contract to buy the same after 3 months for repayment at the spot rate plus the forward premia. This will help banks to swap their dollar borrowings with Rupee and RBI considers the same as IRS. This is nothing but the rupee cost of fully hedged dollar position. Here we, use a foreign reference rate and normally the same is LIBOR which is widely used in the market and the rupee-dollar forward premia for the relevant period.

Suppose today the 3 months LIBOR is 1.5%p.a. and Rupee – Dollar Exchange spot rate is INR48/- and the forward premia is INR0.35p for 3 months (2.9%p.a.). The MIFOR will work out to MIFOR = ((1+ LIBOR%/term)*(1+Forward premia%/term) – 1)* term*100 = ((1.00375 * 1.0073) -1)*(12/3)*100 =4.4276 and the price quote will be Price = 100 – 4.4276 = 95.5724. Like MIBOR contracts the daily settlement is to be done at the close price of the Futures contracts. Close price would be last '*n*' minutes weighted average prices of the deals reported to the market. On Expiration day the final settlement would be on the basis of either average MIFOR rate if polled daily or the MIFOR rate that will be polled and calculated on the expiration date. The forward premia disseminated by various reliable agencies may also be taken for calculation of MIFOR.

The following example will be helpful in understanding the product. Suppose on 10th January HSBC entered the market at 100 – 4.4276 = 95.5724 for March Contract expiring on March 31, 2003. On the day close the Futures market price is 95.9875. The position

will be MTM at 95.9875and the loss will be = 95.9875–95.5724 = 0.4154 per Rs.100 FV of contract. This has to be brought in by HSBC and paid out to the bank that has made profit. And the Futures positions will be all marked to the base price of 95.9875 for 11th January 2003. And on expiration date all futures position outstanding on March 31th will be marked to the MIFOR rate that will be released to the market by the Exchange at the close of trading period and differences will be settled.

Settlement of a futures contract is a must, but the settlement can be either cash or in terms of delivery. If the settlement is cash, it would enhance liquidity since delivery would not be constraint at the time of settlement. International experience also vindicates the position that cash settlement adds to the liquidity of the futures contracts as evidence by the significantly higher trading in Eurodollar futures. And the institutional requirement for a cash settlement would be far simpler and it would be easy to start with. The experience of equity derivatives market can also be used here.

Conclusion:

The bond market is developing very fast and introduction of retail market is likely to bring much needed support to the market. The need for a interest rate derivatives market is spelt out in many quarters. Given the substantial volatility sometimes witnessed in the bond markets over last few years, it is the need of the day to provide for more risk hedging instruments. Interest rate futures, given the fact that they are the largest traded derivatives contract worldwide, are the ideal instrument to introduce to provide hedging mechanism to market participants. These products are going to give the banks and institutions as well as corporates the long felt need to deal in contracts with guarantee of settlement.