Forex rates movement- "Classical Interest rate differential theory" and its practical limitations

Let me start with a caveat, “inter se” movement between currencies and the premia or discount that one currency commands over another currency, over a period depend on various factors. Just to list a few:

a) The respective Interest rates in each currency,

b) short term availability and requirement of the currencies,

c) Balance of payments of trade movement in the short term between two countries ,and of course the most important
d) Government regulations and restrictions imposed on the currency

e) Intervention by the Government in buying/selling of the currencies

f) Speculative play by private players

Discussion here would be on incremental inter se movements between currencies and not on the base rate itself. The base currency rate between two or more currencies depend on factors starting from Purchase power parity, Balance of payments of trade as of a certain date and various other factors including historical,which is possibly a subject for discussion for another day.

Just to make it doubly clear this piece is only on movement of Forex rates between currencies and the way forward premia /discount gets fixed between the currencies. For the sake of simplicity, we will take USD and INR with which people are generally familiar.
One compelling theory and what could be termed as a classical one on forex movement is the one with reference to “Interest rate differential between currencies”. This is the simplest, most logical and something which should work if the market is perfect and there are no restrictions on currency movement, investment or borrowing in the currencies under study.

What is “Interest rate differential theory”? First let us define what is interest rate? People understand that interest rate is the rate an investment fetches in a certain currency. A deposit in India in Indian rupee fetches anything between 5-10% depending on the period of deposit etc. Similarly a deposit in USD in US would fetch something in the region of 2%-4%. We all broadly know that Interest is a function of the underlying inflation of the country's economy and the real return expectations.

The comparable difference between interests can be termed "Interest rate differential".

Let us start off with a base rate of 1 USD = INR 55. To make understanding easy, let us also assume that the interest in USD is 2% and interest in INR is 8%. $1 deposit would at the end of one year be equal to $1.02 and a Rs. 55 deposited for one year would be Rs. 55*1.08=Rs. 59.40. In an ideal situation, USD 1.02 should equal Rs. 59.40 that is 1 USD should be Rs. 59.4/1.02 ,that is, Rs. 58.24 one year from now. The one year forward premia on USD ,which fetches you Rs. 55 immediately and where the interest rate differential is 6% (8%-2%) should be Rs 3.24 , (58.24-55.00) to a USD. If this is not the case, there would be a situation of what is termed “arbitrage” or opportunities to make riskless profit. Let us see it can happen.

Let us assume that at the interest levels specified, the actual forward rate quoted at the end of one year is at INR 55 to a USD, that is there is no premia or discount.

Easy way to make profit is

- borrow in USD,
- convert to INR immediately,
- deposit in INR,
- simultaneously take a forward cover to buy USD at INR 55.

Let us calculate the flows.
Since you have borrowed in USD, you will have to pay $1.02 with interest at the end of one year.

USD converted to INR 55 and deposited would become INR 59.40 at the end of one year since INR deposit attracts 8% interest.

Since a forward cover has been taken, you would be in a position to buy USD of 1.02 for a total outflow of INR 1.02*55=Rs. 56.10. This leaves you Rs 59.40-Rs 56.10=Rs3.30 as riskless profit.

In the same case, if at the same interest rates, INR one year forward rate had been INR 62 to USD, we will be doing the borrowing in INR, depositing in USD, take one year forward cover to sell USD

Let us work out the simple math in this sequence.

You had borrowed INR 55 for a year, to be returned after a year would be Rs 55*1.08=59.40

INR borrowed was converted to 1 USD at the beginning has been deposited as USD deposit. At the end of one year we get USD 1.02.

Since we had a cover to sell USD at the rate of INR 62 to a USD, we will sell the $1.02 at INR 62 to a USD and get on hand INR 1.02*62 =63.24 at the end of one year.

At the end of one year, we can pay off the INR borrowings of Rs 55 with interest, Rs.59.40 and would be left with INR 63.24-59.40=Rs.3.84 as riskless profit.

Through this iteration, one will find that forward premia of Rs 3.24 to a USD is the equilibria rate.

We have assumed no difference in interest rates between borrowing and investing and also no difference between buying and selling of currency. Margins between these two will make a slight difference in the calculations but the theory holds good.

As a thumb rule, arbitrage opportunity will arise when the currency forward rate is different from the interest rate differential. Normally in such situations the demand/supply for the currencies adjusts in such a way that the interest rates move and nullify the advantage. If this kind of anomaly were to persist, everyone will be doing this set of transaction and the interest rates and the demand for the currency will drastically undergo a change till such time equilibrium is attained.

This is a theory, a sound one at that but will continue to be theory till such time, we have free currency movements and unrestricted deposit and borrowings in any currency in any country or at least in the countries of the currencies in question/discussion. It has its practical limitations in the current economic milieu but can be very useful pointer for course corrections and to see through huge anomalies.
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