**Triangular and Locational Arbitrage**

Triangular Arbitrage

Suppose you observe the following exchange rates:

0.8155 €/$

1.3235 CD/$

0.635 €/CD

The “fair“ crossrate is 0.8155 €/$ = 0.61617 €/CD

1.3235 CD/$

There is a triangular arbitrage opportunity here.

At 0.635 €/CD, the CD is more expensive than it should be and the € is cheaper than it should be – because the CD costs € 0.635 rather than the € 0.616 it “should” cost.

Arbitrage: Buy the cheap currency and sell the expensive one

Buy € and sell CD

Start with $1,000,000 and convert it into CD. Note that you must convert the $ into CD so that you can sell the CD and buy euros. If you had bought euros with your $, you would have then had to sell the cheap euros and bought the expensive CD – resulting in a loss.

If you start with $1 million, you earn a riskless instant profit of $30,561.

Note that we simplified this by not showing bids and asks.

What causes arbitrage to disappear?

If everyone sells CD and buys €, the cross XR will adjust to the fair crossrate. Dealers who see all their order flow going in one direction will adjust their quotes.

Since there is not just one price for a currency, but two, let’s look at triangular arbitrage with both a bid and and an ask price for each currency.

We observe the following indirect quotes:

Bid Ask

1.25 SF/$ 1.28 SF/$

.812 €/$ .818 €/$

1.58 SF/€ 1.60 SF/€

This is the same as these direct quotes:

Bid Ask

0.78125 $/SF 0.80 $/SF

1.2225 $/€ 1.2315 $/€

0.625 €/SF 0.6329 €/SF

To determine the “fair” crossrates, you must divide the bid by the ask for one XR and divide the ask by the bid for the other XR

First: 1.25 SF/$ = 1.528 SF/€

.818 €/$

Next: 1.28 SF/$ = 1.576 SF/€

.812 €/$

Note that the true crossrates (bid = 1.58 and ask = 1.60) are both higher than the two fair rates.

So one euro should (cost) be worth 1.528 or 1.576 SF but it actually costs 1.58 or 1.60 SF

So the euro is expensive and the SF is cheap

Buy the cheap SF and sell the expensive euro

1. Start with $1,000

Sell $ at .812 €/$ or buy euros at 1.2315 $/€

End up with € 812

2. Sell euros at 1.58 SF/€ or buy SF at 0.6329 €/SF

End up with SF 1,282.96

3. Sell SF at 0.78125 $/SF or buy $ at 1.28 SF/$

End up with $1,002.31

You made $2.31 through Triangular Arbitrage

This triangular arbitrage will tend to go away because:

Indirect quotes:

Everyone sells dollars and buys euros

so bid price of dollars goes down from .812 €/$

Everyone sells euros and buys SF

Everyone sells SF and buys dollars

so ask price of dollars goes up from 1.28 SF/$

If SF/$ goes up and €/$ goes down,

the “fair” crossrates of 1.25 SF/$ = 1.528 SF/€ and 1.28 SF/$ must go up

.818 €/$ .812 €/$

At the same time, the actual cross rate of 1.58 SF/€ goes down.

So the “fair” crossrates will equal the actual cross rate in equilibrium.

Locational Arbitrage

Remember that you (you are not a dealer) always buy at the ask and sell at the bid.

If Dealer A has its ask lower than the bid of Dealer B, you can do locational arbitrage.

Example:

Dealer A Dealer B

Bid Ask Bid Ask

17 Peso/$ 17.5 Peso/$ 18 Peso/$ 18.5 Peso/$

Buy dollars from A and sell them to B

But with every one buying dollars from A, his ask price will go up

And with everyone selling dollars to B, his bid price will go down

So in equilibrium, A’s ask will be > B’s bid