CHARTA LEARNING · LESSON NOTES

Covered Interest Parity Lost

FRM Part II

1 A story: a euro bank that needs dollars

- Rhenmark Bank: funded in euros, lends in dollars
- Needs $102m of dollar funding for one year
- Route 1: borrow dollars directly, unsecured
- Route 2: borrow euros and swap them into dollars
- Which is cheaper? The gap is the basis

IN THE LESSON

- Meet Rhenmark Bank, a made up lender based in the euro area.
- Its depositors give it euros, but many of its borrowers want dollars.
- So Rhenmark is funded in euros and lends in dollars.
- This year it needs one hundred and two million dollars of funding for one year.
- It has two routes.
- The first is to borrow dollars directly, unsecured, from lenders in the money market.
- The second is to borrow euros, which it can do cheaply at home, and swap them into dollars.
- Swapping means handing over euros now in return for dollars, with an agreement to swap back later.
- Which route is cheaper?
- If markets priced everything consistently, the two would cost the same.
- The gap between them is called the cross currency basis, and it is the subject of this lesson.

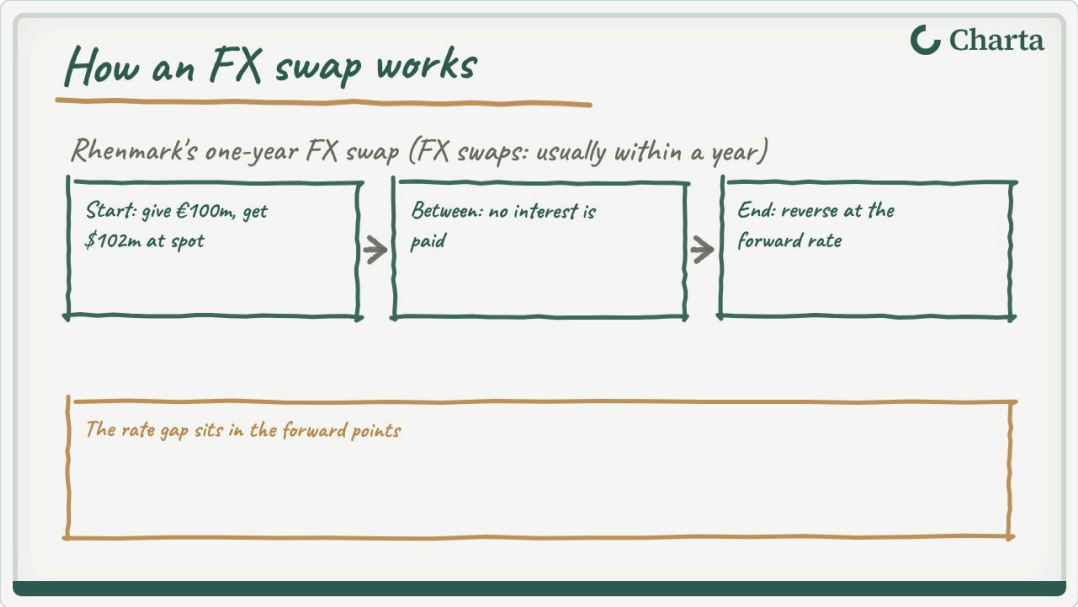
2 The language of currency deals

- Spot rate: the price for an exchange now
- Forward rate: price agreed now, exchange later
- Quoted here as dollars per euro: spot 1.0200
- Forward points = forward rate − spot rate
- 1 pip = 0.0001; 1 basis point (bp) = 0.01%

IN THE LESSON

- First, some language.
- The spot rate is the price for exchanging two currencies now.
- The forward rate is a price agreed today for an exchange on a later date.
- Throughout this lesson we quote rates as dollars per euro, so a spot rate of one point zero two zero zero means one euro buys one point zero two dollars.
- Forward points are the forward rate minus the spot rate.
- They are counted in pips, where one pip is one ten thousandth, the fourth decimal place.
- Interest rate gaps are counted in basis points, where one basis point is one hundredth of one per cent.
- So fifty basis points is half of one per cent, and one hundred basis points is one per cent.

3 How an FX swap works



IN THE LESSON

- An F X swap is two exchanges of currency joined together.
- Here is Rhenmark's one year F X swap.
- F X swaps are short, usually within a year.
- At the start, Rhenmark gives one hundred million euros and gets one hundred and two million dollars, because one hundred million times the spot rate of one point zero two is one hundred and two million.
- Between the two dates, no interest is paid by either side.
- At the end, the exchange is reversed at the forward rate agreed at the start: Rhenmark hands back dollars and gets its euros.
- Notice what is missing.
- There are no interest payments at all.
- So where does the gap between dollar and euro interest rates go?
- The rate gap sits in the forward points.
- The forward rate differs from spot by just enough to pay for the difference in interest.

4 Where the forward points come from

F = S × (1 + r$) ÷ (1 + r€)
Forward points = F − S

Forward rate, F	Forward rate, dollars per euro
Spot rate, S	Spot rate, dollars per euro
Dollar interest rate, r$	Dollar interest rate, one year
Euro interest rate, r€	Euro interest rate, one year

IN THE LESSON

- Where do the forward points come from?
- From a simple no arbitrage idea.
- If I hold one euro, I can earn the euro rate for a year and then convert at a forward rate fixed today.
- Or I can convert at spot now and earn the dollar rate.
- Both routes are free of currency risk, so they should give the same dollars.
- That gives the forward rate, F, equal to the spot rate, S, times one plus the dollar interest rate, divided by one plus the euro interest rate, for a one year deal.
- Forward points are F minus S.
- For a shorter deal, multiply each rate by the fraction of a year.
- When dollar rates are above euro rates, the forward is above spot, so the points are positive.
- This rule is covered interest parity, and we test it properly later in the lesson.

5 Example 1: Rhenmark's forward points

Spot 1.0200 $ per €; dollar rate 4.00%, euro rate 2.00%; one year

Parity forward	1.02 × 1.04 ÷ 1.02	**1.0400**
Parity forward points	1.0400 − 1.0200	**200 pips**
Market forward quoted	by Rhenmark's dealer	**1.0450**
Market forward points	1.0450 − 1.0200	**250 pips**
Gap beyond parity	250 − 200	**50 pips**

IN THE LESSON

- Spot is one point zero two zero zero dollars per euro, the one year dollar rate is four per cent, and the euro rate is two per cent.
- The parity forward is one point zero two times one point zero four, divided by one point zero two, which is one point zero four zero zero.
- The parity forward points are one point zero four zero zero minus one point zero two zero zero, two hundred pips.
- Those points carry the two per cent gap between the interest rates.
- Now Rhenmark asks its dealer, and the market forward quoted is one point zero four five zero.
- The market forward points are one point zero four five zero minus one point zero two zero zero, two hundred and fifty pips.
- The gap beyond parity is two hundred and fifty minus two hundred, fifty pips.
- Rhenmark must hand back more dollars at the end than parity says.

6 Example 2: the dollar cost of swapped dollars

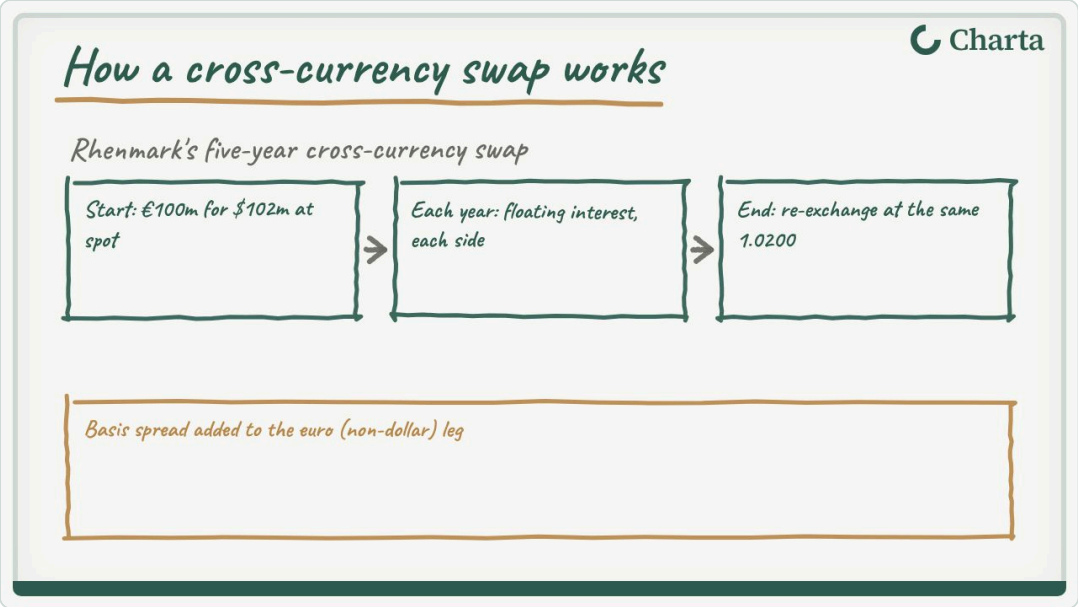
Borrow €100m at 2%; swap into dollars at 1.0200; buy back €102m at 1.0450

Dollars received now	€100m × 1.0200	**$102.00m**
Euros owed in a year	€100m × 1.02	**€102.00m**
Dollars paid to buy them	€102m × 1.0450	**$106.59m**
Swapped dollar rate	(106.59 − 102) ÷ 102	**4.50%**
Extra over direct 4.00%	(4.50% − 4.00%) × $102m	**$0.51m**

IN THE LESSON

- Rhenmark borrows one hundred million euros at two per cent, swaps them into dollars at one point zero two zero zero, and buys back the euros it will owe, forward at one point zero four five zero.
- It receives one hundred million euros times one point zero two, so one hundred and two million dollars now.
- In a year it owes one hundred million times one point zero two, which is one hundred and two million euros, principal plus interest.
- Buying those forward costs one hundred and two million times one point zero four five, which is one hundred and six point five nine million dollars.
- So the swapped dollars cost one hundred and six point five nine minus one hundred and two, divided by one hundred and two: four point five per cent.
- Borrowing dollars directly costs four per cent.
- The extra half per cent on one hundred and two million is five hundred and ten thousand dollars a year.

7 How a cross-currency swap works



IN THE LESSON

- A cross currency swap does the same job over a longer period, often several years, and it is built differently.
- Here is a five year swap for Rhenmark.
- At the start, principal is exchanged at spot: one hundred million euros for one hundred and two million dollars.
- Each year, each side pays floating interest in its own currency.
- Rhenmark pays the dollar floating rate on the dollars it received, and its counterparty pays the euro floating rate on the euros.
- Floating means the rate is reset each period to the market rate.
- At the end, the principal is re-exchanged at the same rate as at the start, one point zero two zero zero, not at a forward rate.
- Finally, the basis spread is added to the euro leg, which is the non dollar leg.
- That spread is where the basis shows up.

8 Example 3: one year of the cross-currency swap

€100m for $102m; dollar floating 4.00%, euro floating 2.00%, basis −0.50%

Rhenmark pays: dollar leg	$102m × 4.00%	**$4.08m**
Rhenmark receives: euro leg	€100m × (2.00% − 0.50%)	**€1.50m**
Its own euro funding cost	€100m × 2.00%	**€2.00m**
Euro shortfall	2.00 − 1.50	**€0.50m**
Shortfall in dollars	0.50 × 1.02	**$0.51m**

All-in dollar cost: (4.08 + 0.51) ÷ 102 = 4.50%

IN THE LESSON

- Dollar floating is four per cent, euro floating two per cent, and the basis on the euro leg is minus half a per cent, the same gap as before.
- Rhenmark pays the dollar leg: one hundred and two million dollars times four per cent, four point zero eight million dollars.
- It receives the euro leg: euro floating minus fifty basis points, so one and a half per cent on one hundred million euros, one point five million euros.
- But its own euro funding costs two per cent, which is two million euros.
- The euro shortfall is two minus one point five, half a million euros.
- At today's rate of one point zero two, that is about zero point five one million dollars.
- All in, Rhenmark pays four point zero eight plus zero point five one, divided by one hundred and two: four point five per cent.
- Same cost as the F X swap, but paid as periodic interest.

9 FX swap versus cross-currency swap

Same job, borrowing one currency against another; different build

Feature	FX swap	Cross-currency swap
Typical tenor	Within a year	Several years
Interest in between	None	Floating, each currency
Rate gap carried in	Forward points	Periodic interest
Final exchange at	Forward rate	Original spot rate
Basis appears as	Forward off parity	Spread on non-$ leg

IN THE LESSON

- The two swaps do the same job, borrowing one currency against another, but they are built differently.
- Let us set them side by side, row by row.
- Typical tenor, meaning length: an F X swap usually runs within a year, a cross currency swap for several years.
- Interest in between: the F X swap pays none, while the cross currency swap pays floating interest in each currency.
- The rate gap is carried in the forward points for the F X swap, and in the periodic interest for the cross currency swap.
- The final exchange happens at the forward rate in an F X swap, but at the original spot rate in a cross currency swap.
- And the basis appears as a forward that differs from parity in the F X swap, but as a spread on the non dollar leg in the cross currency swap.
- This is the comparison the exam asks you to make.

10 What the two swaps have in common

- Both: borrow one currency against another
- The currency handed over works as collateral
- So both are economically collateralised borrowing
- Booked as off-balance-sheet derivatives, not loans
- Same basis, same cost: 4.50% in both examples

IN THE LESSON

- Now what the two swaps share.
- Both let a party borrow one currency against another.
- Rhenmark borrowed dollars against euros.
- The currency handed over works as collateral: if Rhenmark failed to hand back the dollars, the counterparty would keep the euros.
- So both are, economically, collateralised borrowing.
- Yet both are booked as off balance sheet derivatives, not as loans.
- That means a bank can owe large amounts of dollars through swaps without that debt appearing as borrowing on its balance sheet, which matters when you assess its dollar funding.
- And as our numbers showed, when the basis is the same, the two routes cost the same: four point five per cent in both examples.

11 Example 4: rolling short swaps versus one long swap

5-year dollar loan funded by rolling 1-year FX swaps; basis widens to −1.50% in year 2

Cost, basis −0.50%	4.00% + 0.50%	**4.50%**
Cost after widening	4.00% + 1.50%	**5.50%**
Extra cost a year	1.00% × $102m	**$1.02m**
Extra over years 2 to 5	4 × 1.02	**$4.08m**
5-year swap locks −0.50%	4.00% + 0.50%	**4.50%**

Worst case: in a dollar shortage nobody will roll the swap

IN THE LESSON

- Rhenmark funds a five year dollar loan by rolling one year F X swaps, and in year two the basis widens to minus one and a half per cent.
- At minus half a per cent, its cost is four per cent plus half a per cent, four point five per cent.
- After the widening, with the dollar rate unchanged, the cost is four plus one and a half, five point five per cent.
- The extra cost is one per cent of one hundred and two million, one point zero two million dollars a year.
- If the basis stays there for years two to five, that is four times one point zero two, four point zero eight million dollars.
- A five year cross currency swap would have locked the basis at minus half a per cent, so with the dollar rate at four per cent its cost stays four point five per cent.
- In the worst case, as in a dollar shortage, nobody will roll the short swap at all.

12 Exam traps on the two swaps

- FX swap: the rate gap is in the forward rate
- Cross-currency swap: the rate gap is in periodic interest
- Cross-currency swap (CCS) principal: back at original spot
- Rolling short FX swaps leaves rollover risk
- A long cross-currency swap locks the basis

IN THE LESSON

- Here are the exam traps on the two swaps.
- First, an F X swap carries the interest rate gap in the forward rate, through the forward points.
- Second, a cross currency swap carries it in the periodic interest payments, each side paying floating in its own currency.
- Third, the principal of a cross currency swap is re-exchanged at the original spot rate.
- A common wrong answer says it is re-exchanged at a forward rate.
- Fourth, funding a long dollar asset by rolling short F X swaps leaves rollover risk: the cost can jump at each roll, or the market may refuse to roll.
- Fifth, a long cross currency swap avoids that by locking the basis for its whole life.

13 The cross-currency basis

Basis = r$ (cash) − swap-implied $ rate
Implied $ rate = F × (1 + r€) ÷ S − 1

Cross-currency basis	Deviation from parity
Dollar interest rate, r$	Cash rate: borrow dollars directly
Swap-implied dollar rate	Cost of dollars via the swap
Forward rate, F	Forward rate, dollars per euro

IN THE LESSON

- Now we can define the basis exactly.
- The cross currency basis is the deviation from covered interest parity.
- In this lesson it is the cash dollar rate, what it costs to borrow dollars directly, minus the dollar rate implied by the swap, what it costs to raise dollars by borrowing euros and swapping them.
- The swap implied dollar rate is the forward rate times one plus the euro rate, divided by spot, minus one.
- In a cross currency swap, approximately the same number is quoted as the spread added to the non dollar floating rate.
- If parity holds, the basis is zero.
- A negative basis means that raising dollars through the swap costs more than borrowing them directly.

14 Example 5: Rhenmark's basis

Spot 1.0200, forward 1.0450, euro rate 2.00%, cash dollar rate 4.00%

Swap-implied dollar rate	1.045 × 1.02 ÷ 1.02 − 1	**4.50%**
Basis	4.00% − 4.50%	**−0.50%**
In basis points	0.50% = 50 bp	**−50 bp**
Quoted on the euro leg	euro floating − 50 bp	**1.50%**
Sign	negative	**$ via swap dearer**

IN THE LESSON

- Spot is one point zero two zero zero, the forward is one point zero four five zero, the euro rate is two per cent and the cash dollar rate is four per cent.
- The swap implied dollar rate is one point zero four five times one point zero two, divided by one point zero two, minus one: four point five per cent.
- The basis is four per cent minus four point five per cent, minus half a per cent.
- In basis points, half a per cent is fifty, so the basis is minus fifty basis points.
- Quoted on the euro leg of a cross currency swap, Rhenmark receives euro floating minus fifty basis points, one and a half per cent.
- The sign is negative, so dollars raised through the swap are dearer than dollars borrowed directly.
- That is the cost we found in examples two and three.

15 The basis is a price for dollars

- Basis: demand vs supply of dollars via swaps
- Demand: those who borrow dollars through swaps
- Supply: those who lend dollars through swaps
- More demand than supply: swapped dollars dearer
- So the basis turns more negative

IN THE LESSON

- Why is the basis not zero?
- Think of it as a price.
- The basis reflects an imbalance between demand for dollars through the swap market and the supply of dollars through it.
- Demand comes from those who want to borrow dollars through swaps, handing over another currency.
- Supply comes from those willing to lend dollars through swaps, taking another currency in return.
- When more people want to borrow dollars this way than others are willing to lend, swapped dollars get dearer, just as any scarce good does.
- In our convention, that means the basis turns more negative.
- So to find the drivers, we ask two questions: who wants swapped dollars, and why is supply limited?

16 Who demands swapped dollars

- Non-US banks funding dollar loans and bonds
- Foreign investors buying dollar bonds, hedged
- e.g. Japanese insurers, European asset managers
- Hedging = borrowing dollars through the swap
- Both push the basis more negative

IN THE LESSON

- Who wants swapped dollars?
- First, banks outside the United States that fund dollar assets, dollar loans and dollar bonds, like Rhenmark.
- Many have plenty of home currency deposits but no natural dollar deposits, so they swap.
- Second, foreign investors who buy dollar bonds and hedge the currency risk.
- Examples are Japanese insurers and European asset managers.
- They want the dollar bond's yield but not the risk that the dollar falls.
- And this is the key link: hedging that currency risk means selling dollars forward, which is the same as borrowing dollars through the swap.
- So the hedged investor and the dollar hungry bank stand on the same side of the market, and both push the basis more negative.

17 Example 6: a hedged investor adds to demand

Fund puts €100m in a 1-year US bond at 5%, hedged at the forward of 1.0450

Dollars invested	€100m × 1.0200	**$102.00m**
Dollars in a year	102 × 1.05	**$107.10m**
Euros back, hedged	107.10 ÷ 1.0450	**€102.49m**
Hedged return	102.49 ÷ 100 − 1	**2.49%**
At parity forward 1.0400	107.10 ÷ 1.04 = 102.98	**2.98%**

Hedged 2.49% still beats the 2.00% euro rate: demand persists

IN THE LESSON

- Rhenmark's fund arm puts one hundred million euros into a one year American bond yielding five per cent, and hedges at the market forward of one point zero four five zero.
- It converts the euros at spot, one hundred million times one point zero two, one hundred and two million dollars.
- In a year it has one hundred and two million times one point zero five, one hundred and seven point one million dollars.
- Selling those forward gives one hundred and seven point one divided by one point zero four five, about one hundred and two point four nine million euros.
- The hedged return is two point four nine per cent.
- At the parity forward of one point zero four, it would get one hundred and two point nine eight million, two point nine eight per cent.
- The basis takes about half a per cent, yet the bond still beats the two per cent euro rate, so the fund keeps buying and hedging.

18 Why the supply of swapped dollars is short

- Supply: arbitrageurs, mainly large banks
- Arbitrage uses balance sheet, which is costly
- Costly balance sheet: arbitrage stops early
- Quarter-ends: balance sheet dearest, basis tends to widen
- So a negative basis is not competed away

IN THE LESSON

- Now supply.
- In principle, arbitrageurs, mainly large banks, should lend dollars through swaps whenever the basis is negative, earning the gap.
- But that trade uses balance sheet: the bank must borrow dollars and hold the other side, so its balance sheet grows.
- Balance sheet is costly, because capital and other rules charge for it.
- With costly balance sheet, the arbitrage stops long before the gap is closed.
- The cost is sharpest at quarter ends, when banks' balance sheets are measured for reporting, so many banks shrink just then.
- This is the standard explanation for why the basis tends to widen at quarter ends.
- The result is that a negative basis is not competed away.
- We look at those balance sheet costs in detail later.

19 Example 7: the rate gap does not move the basis

US dollar rate rises from 4.00% to 5.00%; swapped-dollar supply and demand unchanged

New parity forward	1.02 × 1.05 ÷ 1.02	**1.0500**
Parity points	1.0500 − 1.0200	**300 pips**
Market fwd, implied 5.50%	1.02 × 1.055 ÷ 1.02	**1.0550**
Market points	1.0550 − 1.0200	**350 pips**
Gap beyond parity	350 − 300	**50 pips**

Basis 5.00% − 5.50% = −0.50%: the points moved, not the gap

IN THE LESSON

- The American dollar rate rises from four to five per cent, and the supply of and demand for swapped dollars do not change.
- The new parity forward is one point zero two times one point zero five, divided by one point zero two, which is one point zero five zero zero.
- Parity points are now three hundred pips: parity absorbs the whole one per cent rise in the rate gap.
- Swapped dollars still cost half a per cent more than direct dollars, so the swap implied dollar rate is five and a half per cent.
- The market forward is one point zero two times one point zero five five, divided by one point zero two: one point zero five five zero.
- The market points are three hundred and fifty pips.
- The gap beyond parity is three hundred and fifty minus three hundred, still fifty pips.
- So the basis is five per cent minus five and a half per cent, still minus half a per cent.
- The rate change moved the points, not the deviation.

20 Rates and the basis: a trap

- Rate gap itself: priced into the forward points
- So a wider rate gap alone leaves the basis alone
- Policy divergence acts through demand instead
- Higher US rates expected: more dollar assets, more hedging
- More demand: basis more negative

IN THE LESSON

- This is a favourite trap.
- The interest rate gap itself is priced into the forward points, as the last example showed.
- So a wider rate gap, on its own, leaves the basis unchanged.
- Yet monetary policy does matter, through a different channel.
- When policy in America and elsewhere diverges, with higher American rates expected, dollar assets become more attractive.
- Foreign banks hold more dollar loans and bonds, and foreign investors buy more dollar bonds and hedge them.
- Both raise the demand for swapped dollars.
- More demand, with limited supply, pushes the basis more negative.
- So the answer to remember is: divergence moves the basis through demand, not through the rate gap.

21 Drivers of the basis at a glance

Exam point: hedging demand, dollar funding demand, limited arbitrage

Driver	Effect on the basis
Non-US banks' dollar funding	More negative
Hedged buying of dollar bonds	More negative
Policy divergence, higher US rates	More negative
Limited arbitrage capacity	Stays wide; often wider at quarter-ends
The interest rate gap itself	No effect: it is in the points

IN THE LESSON

- The exam point is that the drivers are hedging demand, dollar funding demand and limited arbitrage capacity.
- Here they are in one table, read row by row.
- Dollar funding by banks outside the United States pushes the basis more negative.
- Hedged buying of dollar bonds by foreign investors does the same.
- Policy divergence, with higher American rates expected, adds to both kinds of demand, so again the basis turns more negative.
- Limited arbitrage capacity means the gap is not closed, so the basis stays wide, and it tends to widen at quarter ends.
- Finally, the interest rate gap itself has no effect, because it is in the forward points.
- Remember that last row: it is the most common wrong answer.

22 Covered interest parity, restated

- Forward premium offsets the interest rate gap
- Hedged borrowing costs the same in either currency
- Hedged lending too
- So the cross-currency basis is zero
- Enforced by arbitrage, not by expectations

IN THE LESSON

- Now the big question: why did covered interest parity stop holding?
- First, restate it.
- Covered interest parity says that a currency's forward premium offsets the interest rate differential.
- In other words, once you hedge the currency risk with a forward, borrowing costs the same in either currency.
- The same is true of hedged lending.
- So the cross currency basis is zero.
- Notice the word covered.
- The currency risk is covered by the forward, so nothing depends on where the exchange rate actually goes.
- That is why parity is enforced by arbitrage, not by anyone's expectations.
- If it fails, someone should be able to lock in a profit with no risk.

23 Example 8: the arbitrage that closes the gap

Basis −50 bp: borrow dollars at 4.00%, lend them through the swap at 4.50%

Borrow $102m directly at 4%	102 × 1.04, owed	**$106.08m**
Buy €100m spot, invest at 2%	€100m × 1.02	**€102.00m**
Sell those euros forward	€102m × 1.0450	**$106.59m**
Profit, no currency risk	106.59 − 106.08	**$0.51m**
Return on exposure	0.51 ÷ 102	**0.50%**

IN THE LESSON

- With the basis at minus fifty basis points, an arbitrageur can borrow dollars at four per cent and lend them through the swap at four and a half.
- Borrow one hundred and two million dollars directly at four per cent: in a year it owes one hundred and two times one point zero four, one hundred and six point zero eight million dollars.
- Buy one hundred million euros at spot and invest them at two per cent, growing to one hundred and two million euros.
- Sell those euros forward at one point zero four five zero, for one hundred and six point five nine million dollars.
- The profit is one hundred and six point five nine minus one hundred and six point zero eight, zero point five one million dollars, with no currency risk.
- As a return on the exposure, zero point five one over one hundred and two, that is half a per cent.

24 Why parity held before 2007

- Arbitrageurs: mainly large banks
- Borrow the cheap currency, swap, lend the dear one
- Riskless profit exceeded their costs
- Their trades pushed the forward back to parity
- So the basis stayed close to zero

IN THE LESSON

- Before two thousand seven, parity held tightly.
- The arbitrageurs were mainly large banks.
- Whenever a gap appeared, they would borrow in the cheap currency, swap, and lend in the dear one, exactly as in the last example.
- The riskless profit exceeded their cost of doing the trade, because they could borrow close to risk free rates and the trade used little capital.
- And their trades themselves closed the gap.
- Buying the cheap side and selling the dear side pushed the forward rate back to its parity level.
- So any gap was competed away almost as soon as it opened, and the basis stayed close to zero.

25 2007 to 2009: the gap opens

- Credit risk: lending to banks no longer safe
- Dollar funding shortage for non-US banks
- They rushed to raise dollars through swaps
- Swapped dollars dearer: the basis widened
- Expected to close once the crisis passed

IN THE LESSON

- In the crisis of two thousand seven to two thousand nine, two forces opened the gap.
- The first was credit risk.
- Lending to banks was no longer seen as safe, so the arbitrage, which involves lending and borrowing between banks, was no longer riskless.
- The second was a dollar funding shortage.
- Banks outside the United States had large dollar assets and found it hard to roll their direct dollar borrowing.
- They rushed to raise dollars through swaps instead, which is exactly the demand that pushes the basis more negative.
- At that point the gap could be explained by the crisis, and it was expected to close once the crisis passed.
- The puzzle is what came next.

26 Why the gap stayed open

- Leverage ratios charge gross derivative and repo exposure
- That charge applies whatever the risk
- Capital, liquidity rules: balance sheet dearer
- Higher bank credit spreads raise funding cost
- Policy divergence keeps demand strong

IN THE LESSON

- The gap opened temporarily, then stayed open, because post crisis rules made the arbitrage costly.
- First, leverage ratios charge for gross derivative and repo exposures.
- Second, that charge applies whatever the risk, so even a riskless trade uses up scarce leverage capacity.
- Third, capital and liquidity requirements raised the price of balance sheet more generally.
- Fourth, bank credit spreads rose, so the arbitrageur no longer borrows dollars at a near risk free rate.
- Fifth, on the demand side, strong demand from policy divergence kept the basis wide.
- Put together, the arbitrage became expensive just when demand for swapped dollars was strong.

27 Example 9: the same arbitrage after the crisis

Bank borrows dollars at 4.30%; capital 4% of exposure; hurdle return 10%

Dollars owed	102 × 1.043	**$106.386m**
Profit	106.59 − 106.386	**$0.204m**
Capital tied up	4% × $102m	**$4.08m**
Return on capital	0.204 ÷ 4.08	**5.0%**
Verdict	5.0% is below the 10% hurdle	**Not done**

With no credit spread: 0.51 ÷ 4.08 = 12.5%

IN THE LESSON

- Now the bank borrows dollars at four point three per cent, holds capital of four per cent of the exposure, and needs a ten per cent return on capital.
- It owes one hundred and two times one point zero four three, one hundred and six point three eight six million dollars.
- The swap leg still returns one hundred and six point five nine, so the profit is zero point two zero four million.
- The capital tied up is four per cent of one hundred and two million, four point zero eight million.
- The return on capital is zero point two zero four over four point zero eight, five per cent.
- Five per cent is below the ten per cent hurdle, so the trade is not done.
- With no credit spread, the profit of zero point five one would give twelve and a half per cent on the same capital.
- The return is measured against capital, not the exposure.

28 Mistakes to avoid

- Treating the rate gap as the basis: it is in the points
- CCS principal at a forward rate: no, at original spot
- Sign: negative basis = swapped dollars cost more
- The arbitrage exists; it just costs scarce balance sheet
- Rolled FX swaps do not lock the cost

IN THE LESSON

- Here are the mistakes to avoid.
- Mistake one: treating the interest rate gap as the basis.
- The gap is in the forward points, and the basis is what is left over.
- Mistake two: re-exchanging cross currency swap principal at a forward rate.
- It is re-exchanged at the original spot rate.
- Mistake three: getting the sign wrong.
- In this convention, a negative basis means swapped dollars cost more than direct dollars.
- Mistake four: thinking the arbitrage has vanished.
- It still exists, but it is no longer riskless profit once the cost of scarce balance sheet is counted.
- Mistake five: treating rolled F X swaps as if they locked in the funding cost.
- Only a long swap locks the basis.

29 Recap

- FX swap: spot, then forward; rate gap in the points
- CCS: floating legs, basis on non-$ leg, spot re-exchange
- Basis = cash $ rate − swap-implied $ rate
- Drivers: funding and hedging demand, limited arbitrage
- Broke in the crisis; costly balance sheet keeps it so

IN THE LESSON

- Let us recap.
- An F X swap exchanges currencies at spot and reverses at a forward rate, with no interest in between, so the rate gap sits in the forward points.
- A cross currency swap exchanges principal, pays floating interest in each currency, adds the basis to the non dollar leg, and re-exchanges at the original spot rate.
- The basis is the cash dollar rate minus the swap implied dollar rate, and it is driven by dollar funding demand, hedging demand and limited arbitrage capacity, not by the rate gap itself.
- Parity held before two thousand seven because arbitrage was cheap.
- It broke in the crisis, and stays broken because balance sheet is now costly.

30 Try three quick questions

1. Spot 1.10 $ per €, $ rate 6%, € rate 3%, one year. Parity forward and points?
   Answer: 1.10 × 1.06 ÷ 1.03 ≈ 1.1320: about 320 pips.
2. Same deal; market forward 1.1363. Basis?
   Answer: Implied $ rate 1.1363 × 1.03 ÷ 1.10 − 1 ≈ 6.40%. Basis ≈ −40 bp.
3. Arbitrage earns 0.3% on exposure; capital 5% of exposure; hurdle 12%. Done?
   Answer: 0.3% ÷ 5% = 6% < 12%: not done.

IN THE LESSON

- Try three quick questions.
- Pause, think, then listen.
- Question one.
- Spot is one point one zero dollars per euro, the one year dollar rate is six per cent and the euro rate three per cent.
- What are the parity forward and forward points?
- One point one times one point zero six, divided by one point zero three, is about one point one three two zero, so about three hundred and twenty pips.
- Question two.
- The market forward is one point one three six three.
- What is the basis?
- The swap implied dollar rate is one point one three six three times one point zero three, divided by one point one, minus one, which is about six point four per cent, so the basis is about minus forty basis points.
- Question three.
- An arbitrage earns zero point three per cent on its exposure, capital is five per cent of exposure, and the hurdle is twelve per cent.
- Is it done?
- The return on capital is six per cent, below the hurdle, so no.