International parity conditions, long-run value and the carry trade

Economics

1 A story: one loaf, two towns

- Prices that should match get pushed together
- Some pushes are certain: arbitrage
- Others are only a slow pull or a hope
- Know which condition is which

IN THE LESSON

- Imagine two towns on opposite sides of a river, each with its own coins.
- In the first town a loaf of bread costs four coins.
- In the second it costs one coin.
- A baker notices and starts buying cheap loaves and selling them across the river.
- That is the whole spirit of parity: when two prices that ought to match drift apart, someone has a reason to push them back together.
- But notice the word someone.
- Some pushes are fast and certain, like an arbitrage trade.
- Others are slow, weak, or only a hope.
- The skill at this level is telling which is which.

2 Meet the case: dorins and keshes

- Nadia Okafor, analyst, Fernbank Capital (fictional)
- Two made-up currencies: dorin (DOR) and kesh (KSH)
- Quote DOR/KSH = dorins per one kesh
- Price currency = numerator; base currency = denominator

IN THE LESSON

- Here is our running case.
- Nadia Okafor is a currency analyst at Fernbank Capital, a made-up firm.
- She follows two made-up currencies, the dorin and the kesh.
- A quote is always read the same way.
- The price currency is the one in the numerator, the dorin here, and the base currency is the one in the denominator, the kesh.
- So four point zero zero zero zero dorins per kesh means one kesh costs four dorins.
- If the quote rises, the kesh is getting stronger, and the dorin weaker.

3 Exhibit: the one-year market data

Made-up data; spot 4.0000 DOR/KSH, one year

Item	Value
Dorin interest rate	3%
Kesh interest rate	6%
Expected inflation, dorin	2%
Expected inflation, kesh	5%

IN THE LESSON

- Here is the data she works from, set out like an exhibit in an exam vignette.
- Spot is four dorins per kesh.
- The one-year interest rate is three per cent in dorins and six per cent in keshes.
- So the kesh is the high yield currency and the dorin the low yield one.
- Looking ahead, the market expects inflation of two per cent a year in the dorin economy and five per cent in the kesh economy.
- Notice the pattern.
- The country with the higher interest rate also has the higher expected inflation.
- That is not an accident, and it is the thread that will tie the parity conditions together.

4 Covered interest parity: two routes

Route one: stay at home

Deposit dorins → Earn 3% → Collect 1.03

Route two: the hedged kesh deposit

Buy kesh at 4.0000 → Earn 6% in kesh → Sell forward at F → Collect 1.03

IN THE LESSON

- Our first condition is covered interest parity.
- Picture a dorin investor with one dorin and two routes for a year.
- The first route is simple.
- Deposit the dorin at home, earn three per cent, and collect one point zero three.
- The second route goes abroad but locks everything in.
- Buy keshes at spot, deposit them at six per cent, and, on day one, agree to sell the whole proceeds forward for dorins at a fixed rate.
- Both routes are riskless, so they must pay the same.
- If they did not, traders would pile into the better one until the forward rate moved to close the gap.

5 Covered interest parity as a formula

F = S × (1 + iP) ÷ (1 + iB)
Premium or discount = F ÷ S − 1

Forward rate F	Agreed today, delivered later
Spot rate S	Today's quote, P per B
Dorin rate, price currency	Goes on top
Kesh rate, base currency	Goes underneath

IN THE LESSON

- Here is that equality written as a formula.
- The forward rate equals the spot rate, times one plus the price currency interest rate, divided by one plus the base currency interest rate.
- Price currency on top, base currency underneath, just as in the quote.
- Divide both sides by spot and you get the forward premium or discount, the forward over spot, minus one.
- The currency with the higher interest rate trades at a forward discount, because the interest advantage is paid for by a worse forward price.
- Here the kesh pays more, so the kesh is at a discount.
- The ruling idea is that covered parity is an arbitrage condition: it is enforced by traders, so it holds closely in practice.

6 Example 1: the forward rate and the hedge

Spot 4.0000; dorin 3%; kesh 6%; one year

Forward rate	4.0000 × 1.03 ÷ 1.06	**3.8868**
Forward versus spot	3.8868 ÷ 4.0000 − 1	**−2.83%**
Hedged kesh deposit	1.06 × 3.8868 ÷ 4.0000 − 1	**3.00%**
Dorin deposit at home		**3.00%**

IN THE LESSON

- Let's work it.
- The forward rate is four times one point zero three divided by one point zero six.
- Four times one point zero three is four point one two.
- Divide by one point zero six and you get three point eight eight six eight dorins per kesh.
- Against the spot of four, that is a drop of two point eight three per cent, so the kesh trades at a forward discount.
- Now test the hedged kesh deposit.
- Each dorin buys a quarter of a kesh.
- That grows by six per cent, then sells forward at three point eight eight six eight, which comes back as one point zero three dorins.
- A three per cent return, exactly what the dorin deposit at home pays.

7 Example 2: when the forward is out of line

Dealer's forward is 3.9500, above parity

Borrow dorins at 3%	DOR 4,000,000 × 1.03	**owe 4,120,000**
Convert at spot	4,000,000 ÷ 4.0000	**KSH 1,000,000**
Deposit at 6%	1,000,000 × 1.06	**KSH 1,060,000**
Sell forward at 3.9500	1,060,000 × 3.95	**DOR 4,187,000**
Riskless profit	4,187,000 − 4,120,000	**DOR 67,000**

IN THE LESSON

- Now suppose a dealer quotes the forward at three point nine five, above the three point eight eight six eight that parity allows.
- Nadia can profit with no risk.
- She borrows four million dorins at three per cent, so she owes four million one hundred and twenty thousand at the end.
- She converts at spot into one million keshes, deposits them at six per cent, and ends with one million sixty thousand keshes.
- She sells those forward at three point nine five for four million one hundred and eighty seven thousand dorins.
- After repaying the loan she keeps sixty seven thousand dorins, and she risked nothing.
- That is how arbitrage enforces the condition.

8 Uncovered parity and forward rate parity

Uncovered: E(S1) ÷ S0 − 1 ≈ iP − iB
Forward rate parity: F = E(S1)

Expected spot change	Expected, not guaranteed
Dorin rate, price currency	Dorin rate
Kesh rate, base currency	Kesh rate
Forward rate parity	Forward equals expected spot

IN THE LESSON

- Now remove the hedge.
- Uncovered interest parity says the expected change in the spot rate equals the interest rate differential, price rate minus base rate, roughly.
- The high yield currency is expected to fall by about its interest advantage, so that an unhedged deposit earns the same as a hedged one on average.
- Here the kesh should weaken by about three per cent.
- Notice the word expected.
- Now put the two parities side by side.
- Covered parity says the forward is what the interest rates imply.
- If uncovered parity also holds, the expected future spot equals that same number.
- That is forward rate parity: the forward rate equals the expected future spot rate.

9 Example 3: hedged against unhedged

Unhedged kesh deposit, return in dorins

Spot ends at 4.0000	1.06 × 4.00 ÷ 4.00 − 1	**6.00%**
Spot ends at 3.8868	1.06 × 3.8868 ÷ 4 − 1	**3.00%**
Spot ends at 3.7000	1.06 × 3.70 ÷ 4.00 − 1	**−1.95%**
Hedged at the forward	any ending spot	**3.00%**

IN THE LESSON

- Back to the kesh deposit, this time without the hedge.
- The return in dorins is one point zero six times the ending spot divided by four, minus one.
- Uncovered parity expects the spot to end at the forward, three point eight eight six eight, which gives three per cent on average, the same as home.
- But the average hides a wide spread.
- If spot ends unchanged at four, the return is six per cent.
- If it ends at three point seven, the kesh has lost seven and a half per cent, and the return is minus one point nine five per cent.
- The hedged deposit paid three per cent whatever happened.
- So the hedged version has a guaranteed return, and the unhedged version only has an expectation.

10 Purchasing power parity and the Fisher effect

Relative PPP: expected ΔS ≈ πP − πB
Fisher: iP − iB ≈ πP − πB

Expected spot change	Expected, over the horizon
Inflation gap, P minus B	Expected inflation gap
Interest gap, P minus B	Nominal rate gap
Real rates	Equal across countries

IN THE LESSON

- Two more conditions link to inflation.
- Purchasing power parity, in its relative form, says the exchange rate moves by the inflation differential.
- The currency of the higher inflation country loses value by about the gap.
- Use the expected inflation and you have ex ante relative purchasing power parity.
- The international Fisher effect says the nominal interest gap equals the expected inflation gap.
- That happens when real interest rates are equal across countries, because each nominal rate is a real rate plus expected inflation.
- Be careful with the status of both.
- No arbitrage enforces them.
- Goods take time to move, and real rates can differ for years.
- They are better guides over long horizons than short ones.

11 Example 4: inflation and real rates

Inflation: dorin 2%, kesh 5%; rates 3% and 6%

Real rate, dorin	1.03 ÷ 1.02 − 1	**0.98%**
Real rate, kesh	1.06 ÷ 1.05 − 1	**0.95%**
PPP expected spot	4.0000 × 1.02 ÷ 1.05	**3.8857**
Expected change in spot	3.8857 ÷ 4.0000 − 1	**−2.86%**

IN THE LESSON

- Let's apply both to our data.
- First, the real interest rates.
- In dorins, one point zero three divided by one point zero two, minus one, is point nine eight per cent.
- In keshes, one point zero six divided by one point zero five, minus one, is point nine five per cent.
- Next, ex ante relative purchasing power parity.
- The expected spot is four times one point zero two divided by one point zero five, which is three point eight eight five seven.
- That is a fall of two point eight six per cent for the kesh.
- Compare it with the forward of three point eight eight six eight.
- They are almost the same number, as we shall see.

12 How the conditions link: two chains

Covered plus uncovered parity

Forward gap = interest gap →
Expected change = interest gap →
Forward = expected spot

Fisher plus ex ante PPP

Interest gap = inflation gap →
Expected change = inflation gap →
Uncovered parity follows

IN THE LESSON

- Now the second outcome, how these conditions link to each other.
- Think of them as pieces of a chain, where two links give you a third for free.
- Take the top row first.
- Covered parity says the forward premium equals the interest differential, enforced by arbitrage.
- If uncovered parity also holds, the expected change in spot equals that same differential.
- That is forward rate parity.
- Now the bottom row.
- The international Fisher effect says the interest gap is the inflation gap.
- Ex ante purchasing power parity says the expected currency move is the inflation gap.
- Together they give uncovered parity.

13 Example 5: every link holds

Case A: real rates equal, so every condition agrees

Interest gap	3% − 6%	**−3.00 pts**
Inflation gap	2% − 5%	**−3.00 pts**
Forward discount of kesh	3.8868 ÷ 4.0000 − 1	**−2.83%**
PPP expected change	3.8857 ÷ 4.0000 − 1	**−2.86%**

IN THE LESSON

- Here is the chain in numbers, case A, where all links hold.
- The interest gap is three minus six, which is minus three percentage points.
- The inflation gap is two minus five, also minus three points.
- The forward discount of the kesh, from covered parity, is minus two point eight three per cent.
- The expected change under purchasing power parity is minus two point eight six.
- All four quantities say the same thing, about minus three per cent.
- When everything lines up, the forward premium, the expected spot change, the interest differential and the inflation differential coincide.

14 Example 6: one link breaks

Case B: kesh rate 9%, inflation still 5%

Kesh real rate	1.09 ÷ 1.05 − 1	**3.81%**
Forward (covered parity)	4.0000 × 1.03 ÷ 1.09	**3.7798**
Forward discount of kesh	3.7798 ÷ 4.0000 − 1	**−5.50%**
PPP expected change	3.8857 ÷ 4.0000 − 1	**−2.86%**
Forward overstates the fall by	5.50 − 2.86, about	**2.6 pts**

IN THE LESSON

- Now case B.
- Suppose the kesh interest rate is nine per cent, not six, while expected inflation is still five.
- The kesh real rate is now one point zero nine divided by one point zero five, minus one, or three point eight one per cent, far above the dorin real rate.
- The international Fisher effect has failed.
- Covered parity still holds, because arbitrage does not care about real rates.
- The forward is four times one point zero three divided by one point zero nine, or three point seven seven nine eight, a discount of five point five per cent.
- But purchasing power parity still expects only a fall of two point eight six.
- So the forward overstates the expected fall by about two point six points, and it is no longer an unbiased forecast.

15 The two cases side by side

Kesh fall expected (%)

Forward A	**2.83**
Expected A	**2.86**
Forward B	**5.50**
Expected B	**2.86**

Case A: equal real rates. Case B: kesh real rate 3.8%

IN THE LESSON

- Here are the two cases as bars.
- The vertical axis is how far the kesh is expected to fall over the year, in per cent.
- The four bars come in pairs.
- In case A, the first bar is the forward discount, two point eight three, and the second is the fall expected from purchasing power parity, two point eight six.
- They are practically equal.
- In case B, the third bar is the forward discount, which has jumped to five point five, because covered parity follows the interest rate.
- The fourth bar is the expected fall, still two point eight six, because inflation has not changed.
- The gap between the third and fourth bars is the whole story.
- Covered parity alone does not make the forward an unbiased forecast.

16 Common mistakes so far

- Flipping the quote: price rate goes on top
- Only covered parity is enforced by arbitrage
- Covered parity alone does not make F unbiased

IN THE LESSON

- Before we move on, here are the traps that catch people on these first two outcomes.
- First, flipping the quote.
- If the price currency is in the numerator, its interest rate goes on top.
- Mixing this up gives a forward on the wrong side of spot.
- Second, thinking all the parity conditions are equally solid.
- Only covered parity is enforced by arbitrage.
- The others describe expectations and can fail for years.
- Third, believing that covered parity alone makes the forward an unbiased forecast.
- It does not; you also need uncovered parity.

17 A story: four ways to guess tomorrow's weather

- Anchor one: today's spot rate (random walk)
- Anchor two: the forward rate
- Anchor three: uncovered parity, same as the forward
- Anchor four: purchasing power parity

IN THE LESSON

- Third outcome: how well do the parity conditions forecast a future spot rate?
- Think of guessing tomorrow's weather.
- One forecaster says it will be exactly like today.
- The first is the current spot rate itself, the random walk forecast, tomorrow like today.
- The second is the forward rate.
- The third is uncovered parity, which gives the same number as the forward when covered parity holds.
- The fourth is purchasing power parity, which expects the high inflation currency to fall by the inflation gap.
- We will line them up.

18 Three paths from one spot rate

Chart: Dorins per kesh vs Horizon (years)

- Random walk 4.0000
- PPP 3.8857
- Forward = UIP 3.7798

IN THE LESSON

- Here are the three forecast paths for case B.
- Along the bottom is the horizon, from today to one year.
- Up the side is the exchange rate, dorins per kesh.
- All three start at four.
- The flat line is the random walk, which says the best forecast of any future spot is today's spot.
- The middle line is purchasing power parity.
- It drifts down gently, because the kesh economy has three points more expected inflation, which implies a fall of two point eight six per cent, and it reaches three point eight eight five seven at the end.
- The lowest line is the forward, and uncovered parity: it falls the most, to three point seven seven nine eight, because the interest gap is wide.
- Which line should you trust?
- That depends on the horizon.

19 Example 7: one year later

Case B; spot actually ends the year at 3.9600

Random walk forecast	today's spot	**4.0000**
PPP forecast	4.0000 × 1.02 ÷ 1.05	**3.8857**
Forward = UIP forecast	4.0000 × 1.03 ÷ 1.09	**3.7798**
Misses: walk, PPP, forward	|3.96 − forecast|	**0.04, 0.07, 0.18**
Kesh actually fell	3.96 ÷ 4.00 − 1	**−1.00%**

IN THE LESSON

- Now see how each anchor did over one year.
- Case B again, with spot ending at three point nine six.
- The random walk forecast was four, so it missed by four hundredths.
- Purchasing power parity forecast three point eight eight five seven, a miss of seven hundredths.
- The forward and uncovered parity forecast three point seven seven nine eight, a miss of eighteen hundredths, the worst of the three.
- The kesh fell by only one per cent, not the five and a half the forward implied.
- Over a year or two, the spot rate is hard to beat, and the forward tends to overstate how far the high yield currency falls.

20 Which anchor, over which horizon

- Weeks: spot rate wins
- One to two years: PPP weak, forward poor
- Many years: PPP pull

IN THE LESSON

- Here is how the evidence breaks down along the horizon.
- The line runs from short horizons on the left to long horizons on the right.
- At the left, over weeks and months, the current spot rate is very hard to beat; exchange rates move on news that nobody can predict.
- In the middle, at one to two years, the spot rate is still hard to beat, and purchasing power parity has little power, because real exchange rates can stay far from their average for years.
- The forward rate does worse than you would hope, because high yield currencies often fall by less than the interest gap, or even rise.
- Only at the right, over many years, does purchasing power parity earn its keep, as the long pull of prices wins out.

21 The forward rate is not the market's forecast

- Forward comes from rates, by arbitrage
- It would be quoted whatever traders believe
- Gap to expected spot = expected unhedged profit
- Biased if high-yield currencies fall by less

IN THE LESSON

- This brings us to the biggest trap in the outcome.
- The forward rate looks like a prediction, as in the market thinks the kesh will be worth three point seven seven nine eight.
- It is not.
- The forward comes from interest rates by arbitrage.
- It would be quoted at that level whatever traders believed.
- Suppose traders as a whole expected the kesh to end at three point nine six.
- The forward would still be three point seven seven nine eight, and the difference would be the expected profit from holding keshes unhedged.
- That is also why high yield currencies, which have often fallen by less than the forward implies, are rewarded.

22 A story: the dog on a stretchy lead

- Fair value = where the currency settles when noise fades
- 1. PPP: the real exchange rate reverts to its mean
- 2. Macroeconomic balance and 3. external sustainability
- 4. Reduced-form models: regress on fundamentals

IN THE LESSON

- Fourth outcome: what is a currency fairly worth over the long run?
- Picture a dog on a stretchy lead, walking with its owner.
- The dog runs ahead, lags behind, darts left and right, but over a long walk it stays within reach of the owner.
- The owner is fair value, and the dog is the exchange rate.
- There are four ways to estimate where the owner is.
- The first is purchasing power parity: real exchange rates tend to revert to their long-run average.
- The second is the macroeconomic balance approach: what exchange rate brings the projected current account to a sustainable level?
- The third is the external sustainability approach.
- The fourth is a reduced-form econometric model.
- Let's look at the picture first.

23 Misaligned for years

Chart: Real value vs Years

- Fair value
- Overvalued for years
- Real exchange rate

IN THE LESSON

- Here is the picture.
- Along the bottom is time in years.
- Up the side is the real value of the currency, meaning its value after allowing for prices.
- The thin grey line is fair value, drifting slowly upward as the economy's productivity improves.
- The thick green line is the actual real exchange rate.
- Look at the marked stretch: the currency is clearly overvalued, yet anyone who sold it at the start would have been right about the final direction and wrong for years about the path.
- This is the lesson of the outcome: fair value tells you the direction of the slow pull, not the date it arrives.

24 Example 8: purchasing power parity as fair value

Kesh real exchange rate index; long-run average 100

Real exchange rate now		**115**
Overvaluation	115 ÷ 100 − 1	**15%**
PPP-consistent spot	4.0000 ÷ 1.15	**3.4783**
Fall needed in spot	3.4783 ÷ 4.0000 − 1	**−13.04%**

IN THE LESSON

- Now numbers, starting with purchasing power parity.
- Nadia measures the kesh's real exchange rate as an index, where its long-run average is one hundred.
- Today it reads one hundred and fifteen, so the kesh is fifteen per cent above its long-run average in real terms.
- That points to overvaluation.
- If prices stay as they are, spot would have to fall to four divided by one point one five, which is three point four seven eight three, a drop of thirteen point zero four per cent, for the real rate to return to average.

25 Two current-account approaches

Fall needed = (projected − sustainable) ÷ response × 10%
Stabilising deficit ≈ liabilities × growth

Projected current account	Where it is heading
Sustainable current account	The norm
Response to a 10% fall	GDP points gained per 10% fall
Net foreign liabilities	Share of GDP
Nominal GDP growth	Rate of GDP growth

IN THE LESSON

- The next two approaches both start from the current account.
- The macroeconomic balance approach asks how far the currency must move to bring the projected current account to its sustainable level.
- The gap between the two, divided by how much a currency move changes the current account, gives the needed depreciation.
- The external sustainability approach asks a different question: what current account deficit would keep net foreign liabilities stable as a share of GDP?
- The answer is about the liabilities ratio times nominal growth.
- A country that owes sixty per cent of GDP and grows at four per cent can sustain a deficit near two point four per cent of GDP.

26 Example 9: the two approaches in numbers

Deficit 5% of GDP; 10% real fall adds 1.5 points

Macro balance: gap	5% − 2%	**3 pts**
Macro balance: fall needed	3 ÷ 1.5 × 10%	**20%**
ESA: stabilising deficit	60% × 4%	**2.4% of GDP**
ESA: cut needed	5% − 2.4%	**2.6 pts**
ESA: fall needed	2.6 ÷ 1.5 × 10%	**17.3%**

IN THE LESSON

- Now the numbers.
- The kesh economy runs a projected current account deficit of five per cent of GDP.
- The sustainable level is a deficit of two per cent.
- The gap is three points.
- Suppose a ten per cent real fall improves the current account by one and a half points.
- Then the fall needed is three divided by one and a half, times ten per cent, or twenty per cent.
- Now the external route.
- Net foreign liabilities are sixty per cent of GDP and nominal growth is four per cent, so the stabilising deficit is two point four per cent.
- The cut needed is two point six points, which needs a fall of seventeen point three per cent.

27 Example 10: a reduced-form model

Illustrative regression output for the real exchange rate

Reduced-form model	Value
Productivity coefficient	0.60 (t 4.2)
Terms of trade coefficient	0.25 (t 2.9)
Kesh gap, terms of trade	+4 pts, +8%
Fitted fair value vs mean	+4.4%

IN THE LESSON

- The fourth approach is a reduced-form econometric model.
- It regresses the real exchange rate on its drivers, such as productivity and the terms of trade, and uses the fitted value as fair value.
- Here is made-up output.
- Each point of productivity advantage lifts the fitted real exchange rate by point six per cent, and a one per cent gain in the terms of trade lifts it by point two five.
- The kesh productivity gap is four points and its terms of trade rose eight per cent.
- So the fitted fair value is four times point six, plus eight times point two five, which is four point four per cent above the mean.
- The actual reading is fifteen per cent above the mean.
- One point one five divided by one point zero four four is a ten point two per cent overvaluation.

28 A story: borrowing where it is cheap

- Borrow the low-yield currency (dorin, 3%)
- Invest in the high-yield currency (kesh, 9%)
- UIP: the kesh should fall by about the gap
- Carry trade bets it falls by less

IN THE LESSON

- Our last outcome is the carry trade.
- Picture a trader who borrows a cheap currency, converts the money, and deposits it in a currency that pays much more.
- The trader pockets the interest difference, which is called the carry.
- The risk is that the high yield currency falls against the cheap one, because the loan must be repaid in the cheap currency.
- Here the funding currency is the dorin at three per cent, and the investment currency is the kesh at nine per cent, case B.
- Notice what uncovered parity says.
- The kesh should fall by about the interest gap, wiping out the carry on average.
- The carry trade is a bet that it falls by less.
- In calm years, that bet has often paid.

29 What the carry trade earns

Return = (1 + iinv) × S_end ÷ S_0 − (1 + ifund)
Breakeven S_end = S_0 × (1 + ifund) ÷ (1 + iinv)

Investment rate	Rate earned abroad
Funding rate	Rate owed on the loan
Ending spot	Quote at the end
Starting spot	Quote at the start
Breakeven spot	Same as the forward

IN THE LESSON

- Here is the earnings formula, per unit of the funding currency borrowed.
- Take one plus the investment rate, multiply by the ending spot over the starting spot, which converts the proceeds back into the funding currency, and subtract one plus the funding rate, the loan owed with interest.
- Both the currency move and the interest owed matter, and forgetting either is the classic mistake.
- Set the result to zero and solve for the ending spot, and you get the breakeven: the starting spot times one plus the funding rate, divided by one plus the investment rate.
- That is exactly the forward rate from covered parity.
- Below it the trade loses; above it the trade wins.

30 Example 11: a calm year and a stress year

Borrow DOR at 3%, invest in KSH at 9%; spot 4.0000; DOR 100 million

Breakeven spot	4.0000 × 1.03 ÷ 1.09	**3.7798**
Cushion	3.7798 ÷ 4.0000 − 1	**−5.50%**
Calm year, ends 3.9600	1.09 × 3.96 ÷ 4 − 1.03	**4.91%**
Profit	4.91% of DOR 100m	**DOR 4.91m**
Stress year, ends 3.0000	1.09 × 3.00 ÷ 4 − 1.03	**−21.25%**

IN THE LESSON

- Now run the trade on dorin one hundred million.
- The breakeven is four times one point zero three divided by one point zero nine, which is three point seven seven nine eight.
- So the kesh could fall five and a half per cent before the trade loses.
- In a calm year, spot ends at three point nine six.
- The return is one point zero nine times three point nine six divided by four, minus one point zero three, which is four point nine one per cent, a profit of four point nine one million dorins.
- Now a stress year, where investors flee and the kesh falls to three.
- The return is one point zero nine times three divided by four, minus one point zero three, which is minus twenty one point two five per cent, a loss of twenty one million two hundred and fifty thousand.

31 The carry trade, drawn

Chart: Return vs Ending spot (DOR per KSH)

- Breakeven 3.7798
- Calm: +4.91%
- Stress: −21.25%

IN THE LESSON

- Here is the payoff, drawn.
- Along the bottom is the kesh's ending spot rate, dorins per kesh, from three to four point two.
- Up the side is the return per dorin borrowed.
- The rising line is the return formula.
- It slopes upward because a stronger kesh helps and a weaker one hurts.
- The flat grey line is zero return.
- Where the two cross is the breakeven, three point seven seven nine eight, which is the covered parity forward.
- To its right the trade wins, and at the calm year of three point nine six, the return is four point nine one per cent.
- To its left it loses, and at the stress level of three, the return is minus twenty one point two five per cent.
- The wins are small, and the losses can be large.

32 Small steady gains, one large loss

Profit or loss (% of loan)

Four calm years	**+19.64**
One stress year	**−21.25**

Case B: calm profit 4.91 a year; stress loss 21.25

IN THE LESSON

- Why do professionals fear the carry trade even though calm years pay?
- Because of the shape of the returns.
- Here are two bars, measured as a percentage of the amount borrowed.
- The first is four calm years of profit, at four point nine one each, nineteen point six four in all.
- The second is one stress year, a loss of twenty one point two five.
- One bad year erases more than four good ones.
- The reason is that funding currencies tend to act as safe havens: in a crisis, investors unwind their trades together and rush to buy back the cheap currency, so it surges just when the carry trade can least afford it.

33 Recap: what to carry into the exam

- Only covered parity is enforced; the rest are expectations
- Two parities linked give a third; know which two
- Spot beats forward and PPP over one to two years
- Carry: small steady gains, rare big loss

IN THE LESSON

- Let's pull it together.
- Covered interest parity is enforced by arbitrage: the forward premium offsets the interest differential, so a hedged foreign deposit earns the home rate.
- Uncovered parity, the international Fisher effect and purchasing power parity are statements about expectations, not forced by anyone.
- Link covered and uncovered parity and you get forward rate parity.
- Link the Fisher effect and ex ante purchasing power parity and you get uncovered parity.
- As forecasters, the spot rate is hard to beat over a year or two, the forward overstates the fall of a high yield currency, and purchasing power parity helps over many years.
- Fair value tells you the direction of a slow pull, not the timing.
- And the carry trade earns steady small gains with a rare big loss.

34 Try three quick questions

1. Spot 5.00 DOR/KSH; dorin 2%, kesh 4%. Covered parity forward?
   Answer: 5.00 × 1.02 ÷ 1.04 = 4.9038
2. Covered parity holds. Is the forward an unbiased forecast?
   Answer: Only if uncovered parity also holds.
3. Borrow at 1%, invest at 5%, currency falls 2%. Return per unit?
   Answer: 1.05 × 0.98 − 1.01 = 1.9%

IN THE LESSON

- Now three quick questions.
- Pause after each one.
- Question one.
- Spot is five dorins per kesh, the dorin rate is two per cent and the kesh rate is four per cent.
- What is the covered parity forward?
- Five times one point zero two divided by one point zero four is four point nine zero three eight.
- Question two.
- Covered parity holds.
- Is the forward rate an unbiased forecast of the future spot?
- Only if uncovered parity also holds, since covered parity alone comes from arbitrage and says nothing about expectations.
- Question three.
- A trader borrows at one per cent and invests at five per cent, and the investment currency falls two per cent.
- What is the return per unit borrowed?
- One point zero five times point nine eight, minus one point zero one, is one point nine per cent.