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pricing | analysis | structuring | trading | risk management | revaluation

FX Hedging – the search for the "perfect" hedge

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- The hedging decision process
- Basic strategies
- Using exotics to create effective hedges
- Playing the statistics
- Target redemption structures

The hedging decision process

- The decision of which strategy to select is a function of three main criteria:

    1. View on the future direction of spot
    2. Risk appetite
    3. Internal targets/budget rates

- For every corporate the most appropriate hedge will depend on the answers to these three questions

- There are no guarantees, the future is unknown

The exposure and the forward

- For the purposes of this presentation we will assume the following:

  – A Polish corporate has a future anticipated receipt of €10m in twelve months.

  Reference points:

  - EUR/PLN Spot - 4.102
  - EUR/PLN Fwd - 4.255 → <u>This is our benchmark</u>

- The corporate is long EUR/short PLN and is required to hedge this exposure

What next for the EUR/PLN?

- By design, the relative advantages of certain strategies are dependent on the expected future path of spot …

For example, you are Long EUR …

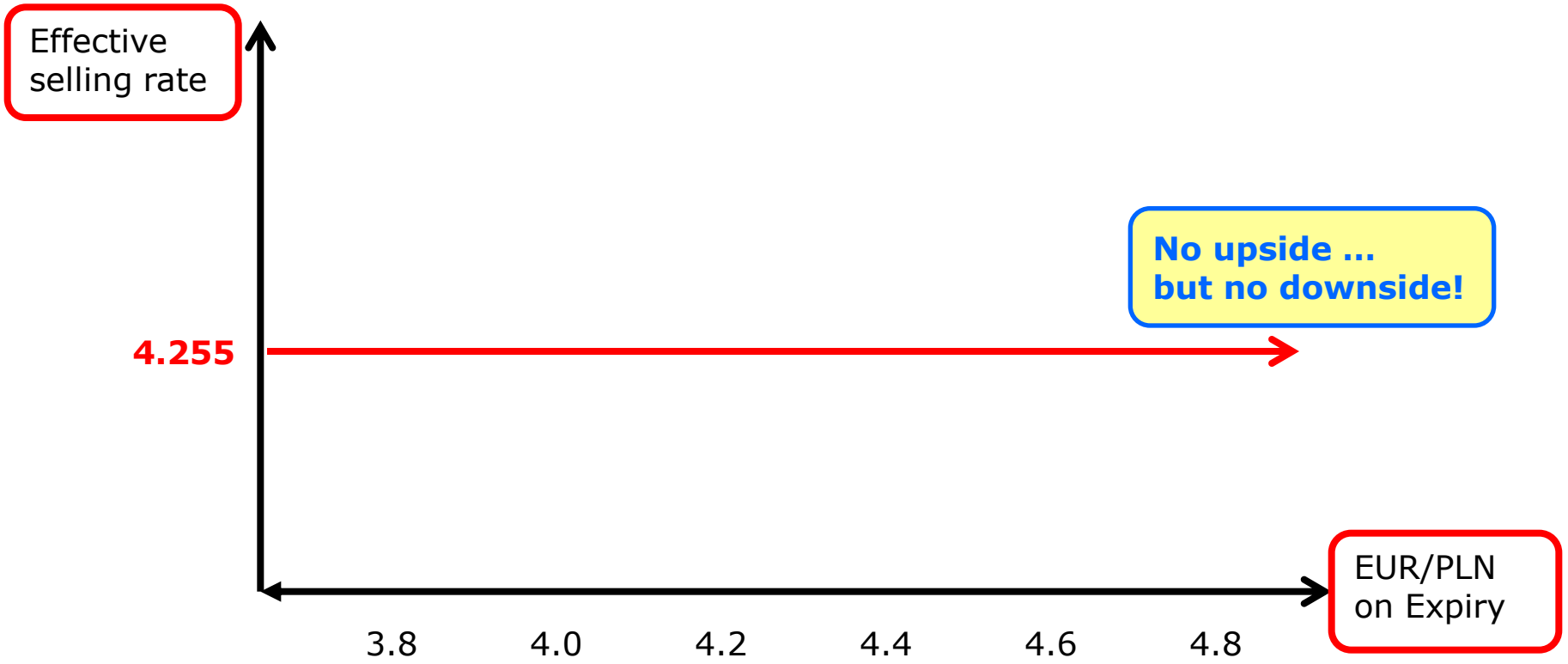
10 year EUR/PLN

If you expect EUR to strengthen, you will benefit from:
- risk reversal
- forward extra (US)
- forward extra (Euro)

If you expect EUR to weaken, you will benefit from:
- forward
- participating forward
- TARF

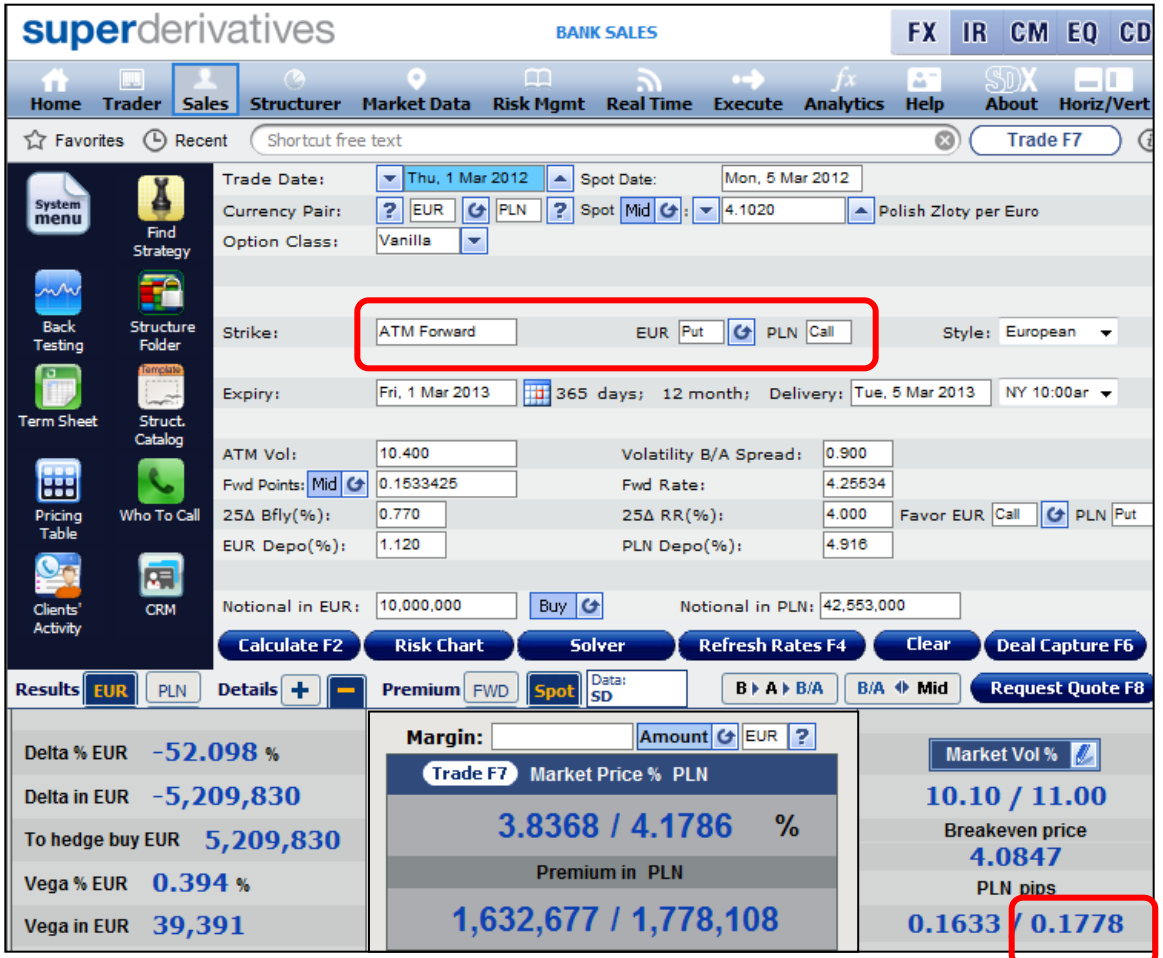
So why not just use a Forward?

- Corporate sells EUR Forward at 4.255
- Regardless of the future spot rate, the net receipt on delivery is fixed at PLN 4.255m



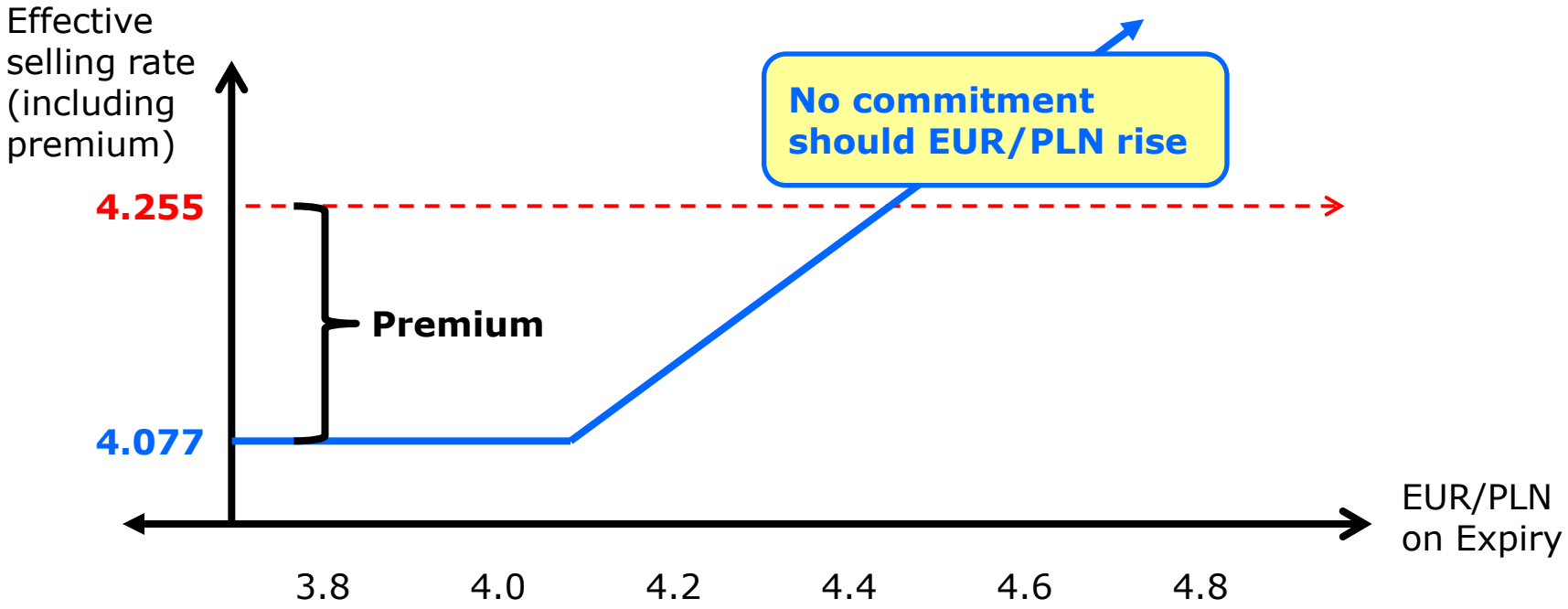
Vanillas are good … but they cost!

At the money forward EUR Put, premium 4.18%



Buying a single Vanilla is good but … it costs money!

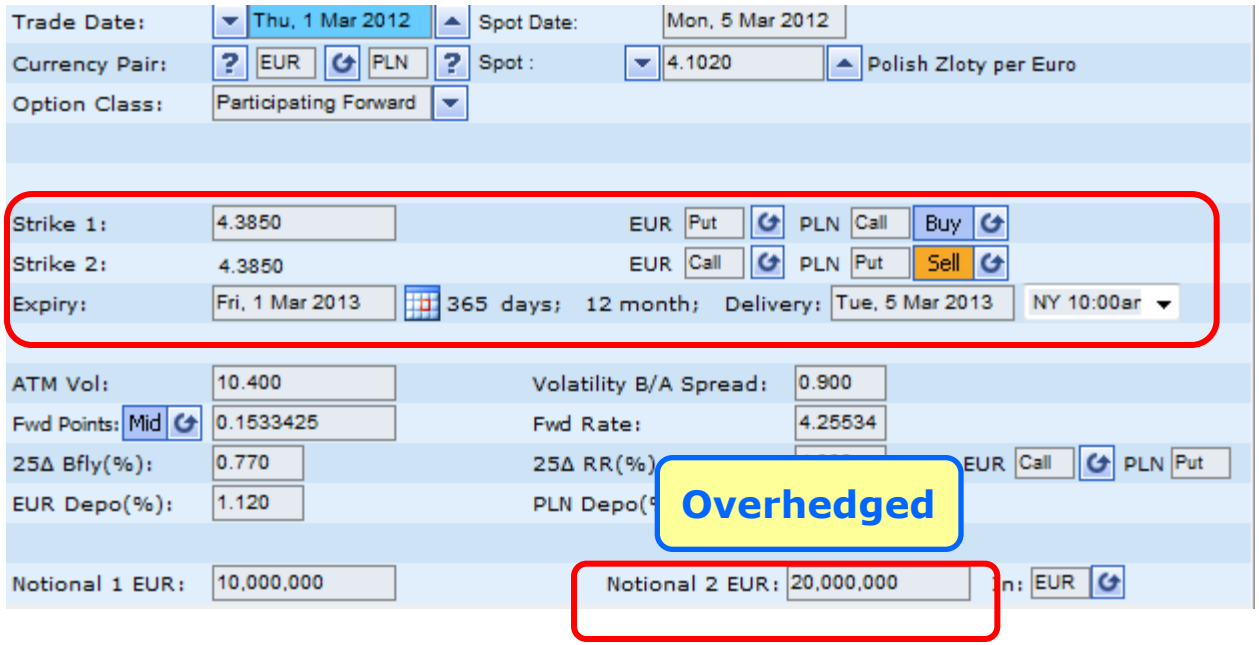
Buy EUR Put at 4.255 (ATMS), Cost 4.18%



Participating Forwards are good if you think your exposure is really at risk.

Buy EUR Put at 4.385 (Spot)

Sell EUR Call at 4.385 on double notional, Zero Cost

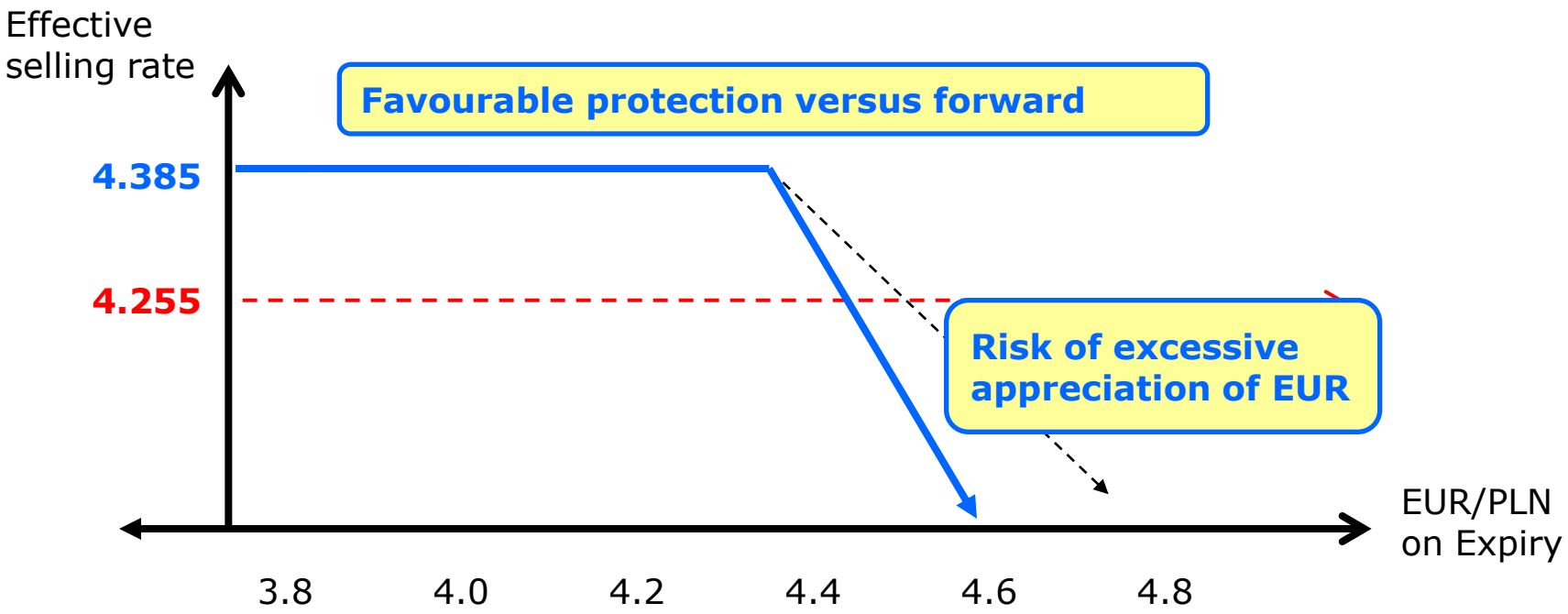


- Gain 13 big figures over the forward but run the risk of excessive EUR strengthening due to the overhedging

Participating Forwards are good but …

Buy EUR Put at 4.385 (Spot)

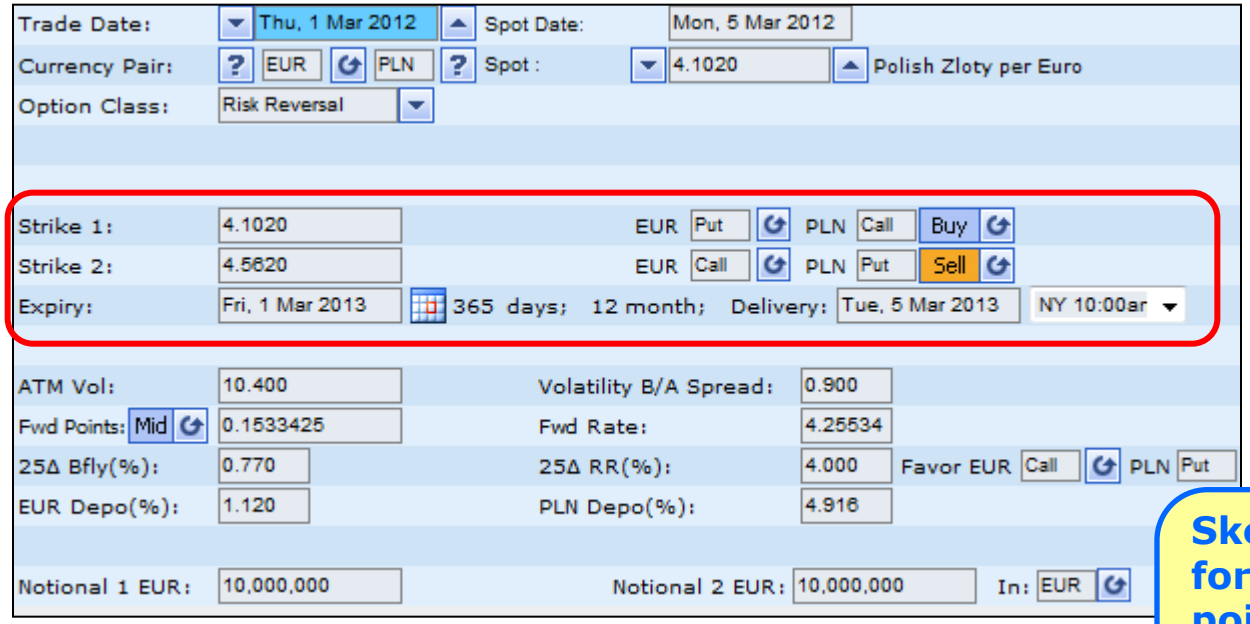
Sell EUR Call at 4.385 on double notional, Zero Cost



Riskies are good …but can be a little symmetrical!

Buy EUR Put at 4.102 (Spot)

Sell EUR Call at 4.562, Zero Cost



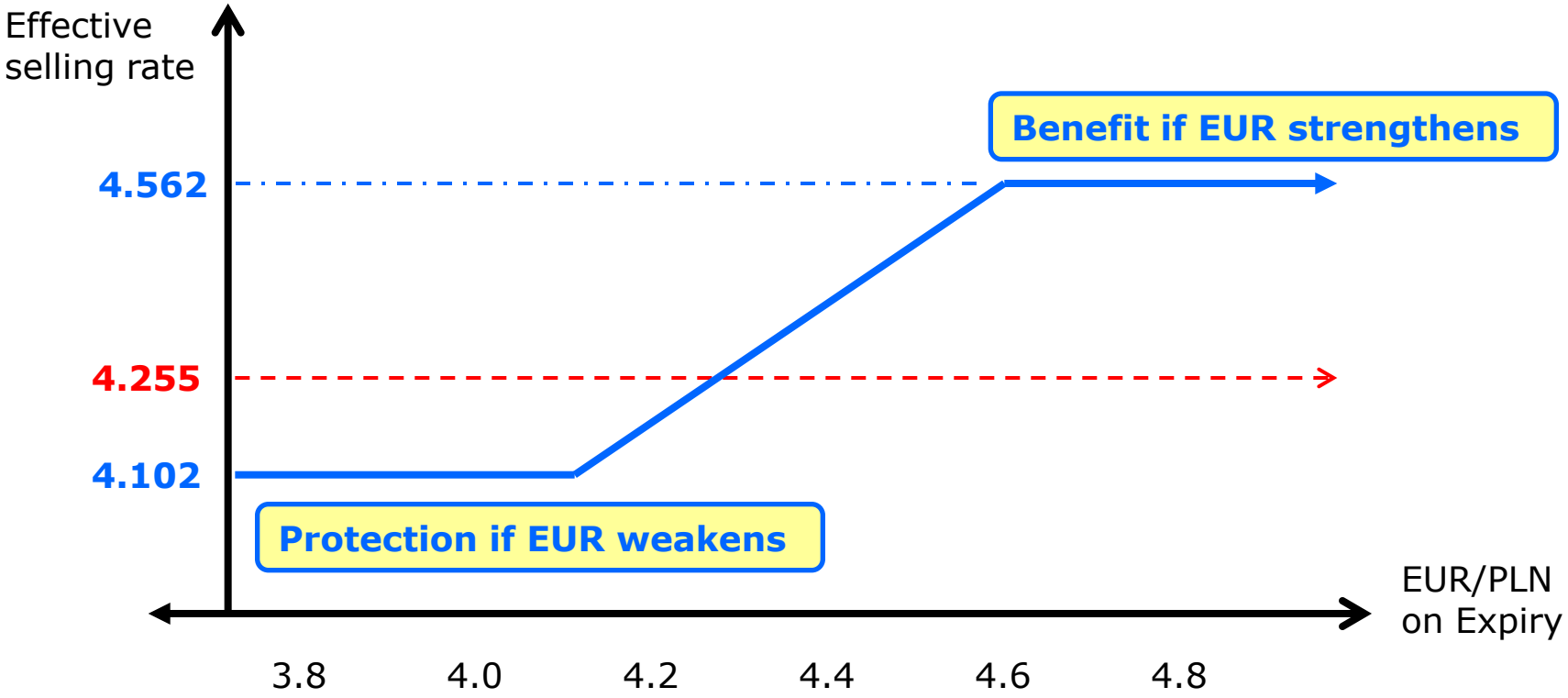
- Give up 15 big figures of protection versus forward to potentially earn 31 big figures

Skew and forward points favour selling calls i.e. benefits exporters

Risk Reversals can be a little symmetrical!

Buy EUR Put at 4.102 (Spot)

Sell EUR Call at 4.562, Zero Cost



There's more than one Zero Cost Risky

Buy EUR Put, Sell EUR Call at Zero Cost

superderivatives **Pricing Table**

Option Description: Risk Reversal

Scenario 1 +

Horizontal: Option1 | Strike

Use Solver Option2 | Strike **For:** Offer Price in % = 0 EUR

Calculate: Strike

Tenor	Strike 3.94	3.96	3.98	4.00	4.02	4.05	4.102
1m	4.3516	4.3319	4.3055	4.2772	4.2481	4.2043	4.1287
3m	4.5324	4.4907	4.4489	4.4077	4.3673	4.3075	4.2034
6m	4.7054	4.6564	4.6084	4.5614	4.5151	4.4461	4.3228
12m	4.9884	4.9341	4.8808	4.8286	4.7769	4.6999	4.5620

Gain or loss versus forward in big figures							
Downside	-31	-29	-27	-25	-23	-20	-15
Upside	74	68	63	58	52	45	31

Forward Extra's offer asymmetrical benefits

In the Forward Extra, the hedge consists of:

Buying a Vanilla Put

Selling a Vanilla Call with the same strike and either:

- American Style ITM knock in barrier
- European Style ITM barrier
- Partial Barrier ITM

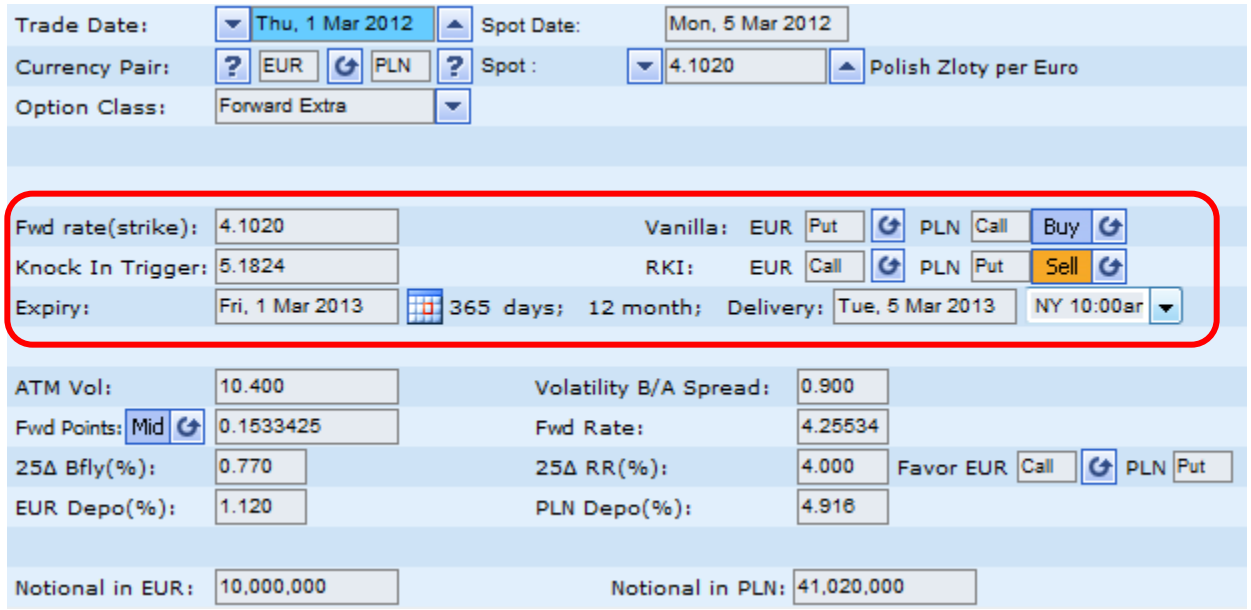
If the sold option is knocked in, the hedger is committed to sell at the structure's unfavourable strike

The structures allows the hedger to give up a small amount of protection for a potentially much larger upside

Forward Extra with US Barrier

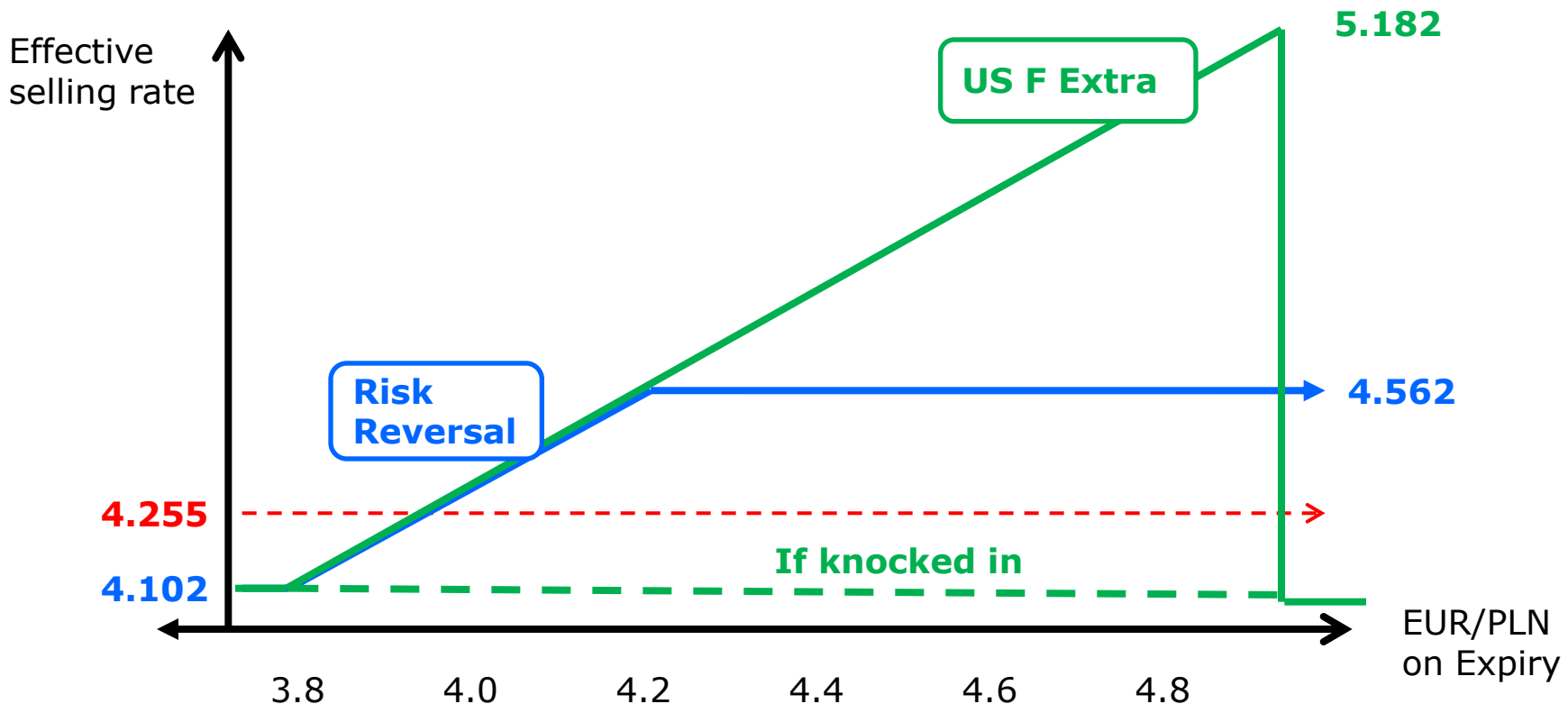
Buy EUR Put at 4.102 (Spot)

Sell EUR Call at 4.102 with US knock in at 5.182, Zero Cost



- Give up 15 big figures of protection versus forward to potentially earn 93 big figures

Forward Extra's can offer significant potential upside at little risk if structured correctly



Forward Extra with US Barrier

But if it's knocked in, then it's useless!

For the forward extra to be attractive, the barrier must be set far enough out the money to be unlikely to be hit, should the spot move in the hedger's favour.

How do we test this?

- Historically
- Implied future probability from option prices

Forward Extra with US Barrier

- Historically, a barrier set 26.2% above spot, was hit less than 22% of the time during a 12 month expiry over the five year testing period

Historical hit ratio of less than 22% over the previous five years

Forward Extra with US Barrier

- One touch options offer a binary payout if the spot price hits a predefined trigger at any up prior to expiry.
- The mid-price of these options therefore gives the implied probability of hitting the barrier.

superderivatives **Pricing Table**

Interrupt | Calculate F2 | Export To Excel | ?

Option Description: Buy One Touch EUR / PLN trigger

Horizontal: One Touch Trigger

Vertical: Tenor

Results: Market Price % PLN Mid Bid Ask

	One Touch Trigger						
Tenor	5.66	5.62	5.58	5.53	5.48	5.38	5.18
1m	0.109	0.109	0.109	0.109			
3m	0.250	0.250	0.375	0.375			
6m	3.001	3.001	3.127	3.253			
1y	6.500	6.750	7.250	7.875	8.500	9.875	12.750

12.75% probability of hitting 5.18 over the next year according to option prices

There's more than one Forward Extra

Buy EUR Put, Sell EUR Call with American Knock In, at Zero Cost

Option Description: Buy Forward Extra Put EUR Call PLN

Scenario 1 +

Horizontal:	Option1	Strike
Vertical:	Option1	Tenor
Results:	Solver	
☑ **Use Solver**	Option2	Trigger

For: Offer Price in % = 0 EUR

Calculate: Trigger

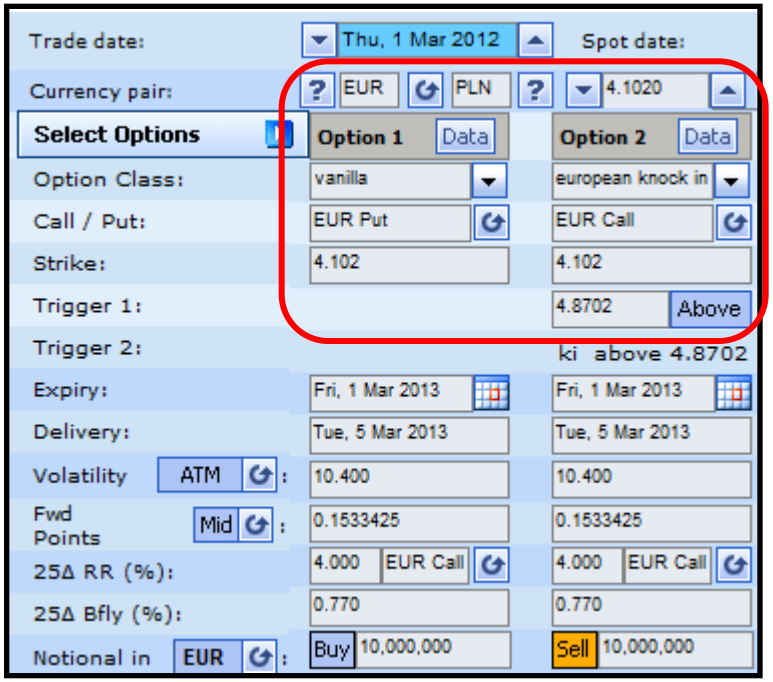
Tenor \ Strike	3.94	3.96	3.98	4.00	4.02	4.05	4.102
1y	5.6623	5.6218	5.5796	5.5352	5.4771	5.3815	5.1824

Gain or loss versus forward in big figures							
Downside	-31	-29	-27	-25	-23	-20	-15
Upside	141	137	133	128	122	113	93
Implied Hit %	6.5%	6.75%	7.25%	7.8%	8.5%	9.87%	12.75%

Forward Extra with European Barrier

Buy EUR Put at 4.102 (Spot),

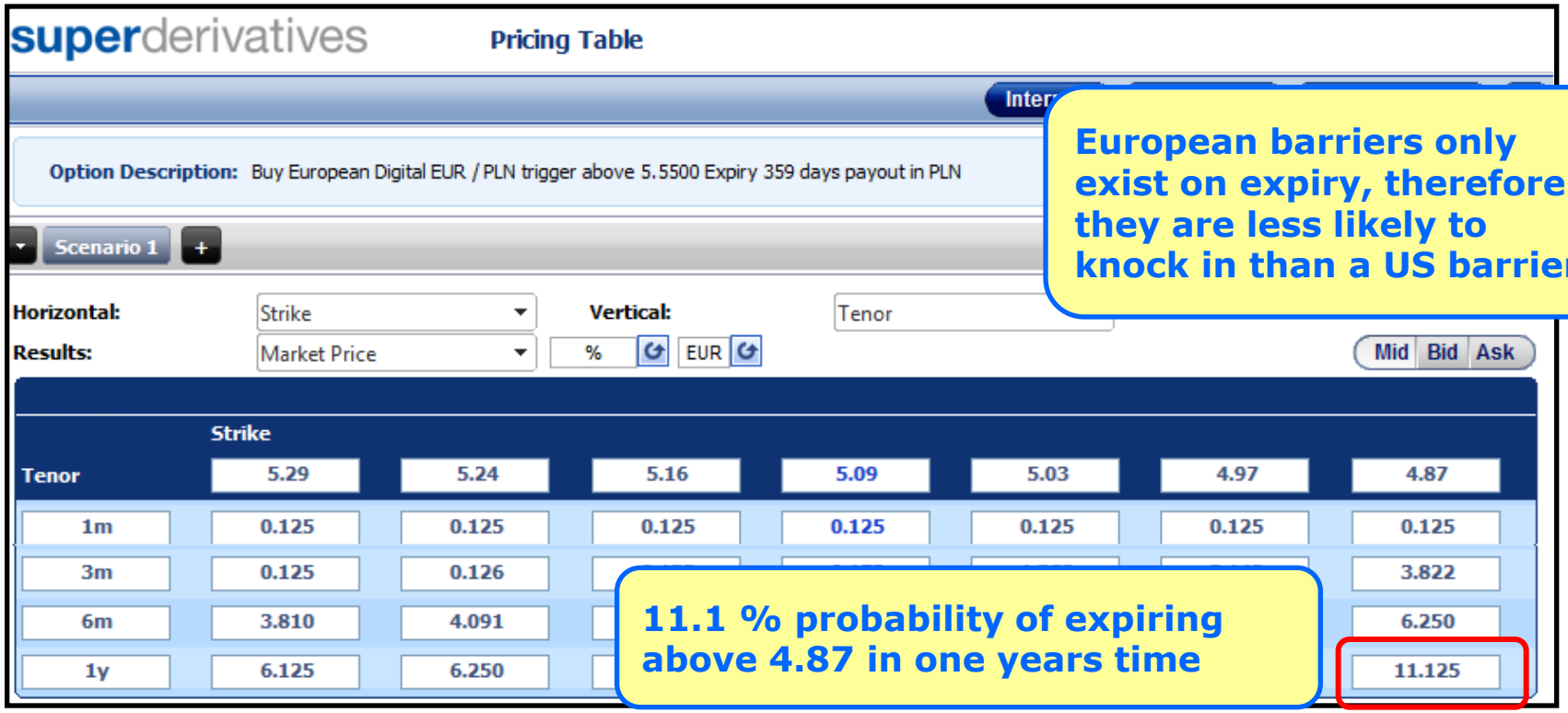
Sell EUR Call at 4.102 knock in above 4.87, Zero Cost



- Give up 15 big figures versus forward to potentially earn 52 big figures

Forward Extra with European Barrier

- European Digital options offer a binary payout if the spot price on expiry is above/below a predefined barrier .
- The mid-price of these options therefore gives the implied probability of expiring above/below the barrier.



There's more than one Euro Forward Extra too!

Buy EUR Put, Sell EUR Call with Euro Knock In, at Zero Cost

superderivatives **Pricing Table**

Interrupt | Calculate F2 | Export To Excel | ?

Option Description: Buy European | Forward Extra Put EUR Call PLN

Horizontal: Option1 | Strike **Vertical:** Option1 | Tenor

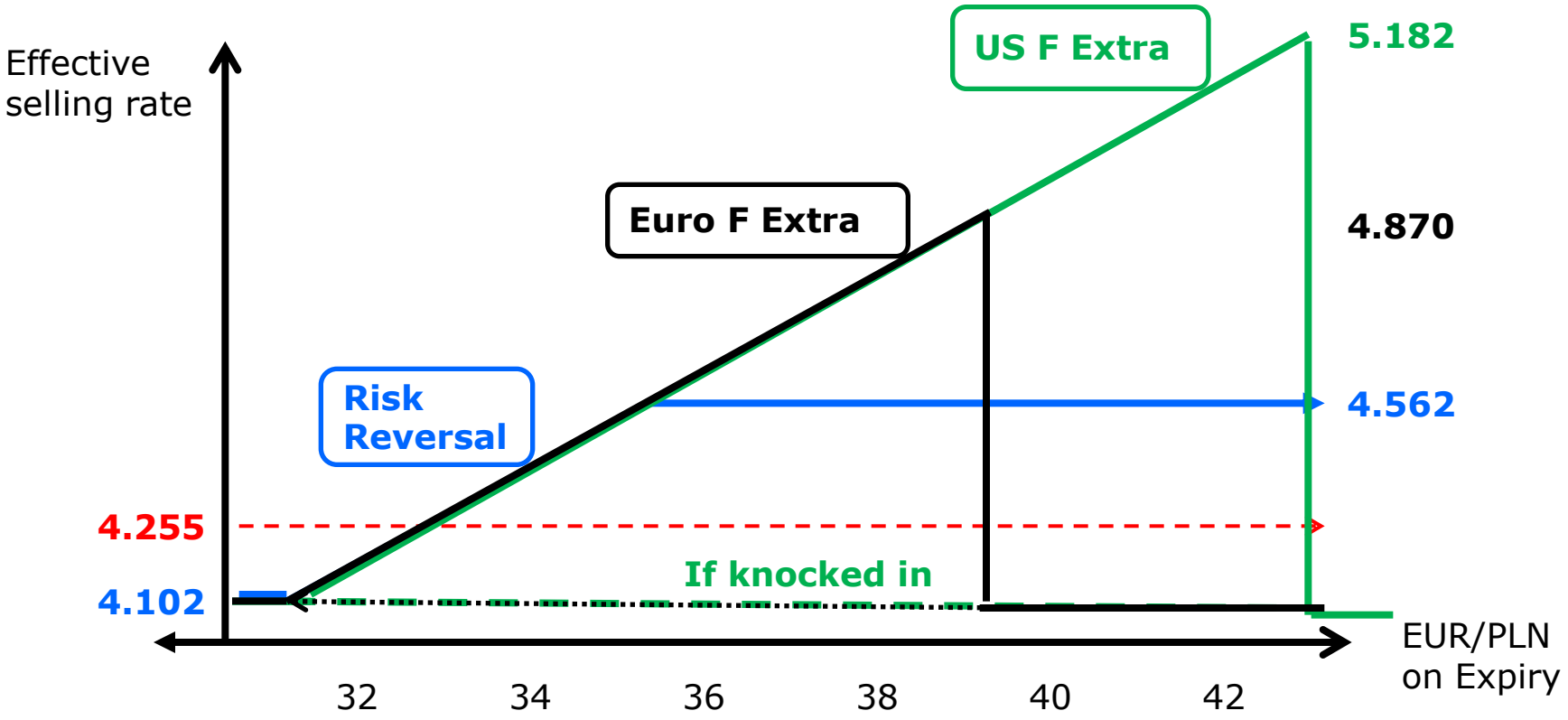
Use Solver Option2 | Trigger **For:** Offer Price in % = 0 EUR

Calculate: Trigger

Tenor	Strike 3.94	3.96	3.98	4.00	4.02	4.05	4.102
1y	5.2935	5.2372	5.1609	5.0905	5.0253	4.9724	4.8702

Gain or loss versus forward in big figures							
Downside	-31	-29	-27	-25	-23	-20	-15
Upside	104	98	91	84	77	72	62
Implied trigger %	6.1%	6.2%	6.6%	7.0%	8.0%	9.1%	11.1%

Forward Extra's can offer significant potential upside at little risk if structured correctly



Summary of key strategies available

1. Sell EUR/PLN Forward at 4.255
2. Buy Vanilla EUR Put at 4.255, Cost 4.18%
3. Participating Forward 4.385 double notional

Buy EUR Put at Spot 4.102 and …

4. Risk Reversal - Sell EUR Call 4.562

or

5. US Forward Extra - Sell EUR Call 4.102 KI 5.182
   - Probability of knock in < 13%

or

6. Euro Forward Extra - Sell EUR Call 4.102 KI Above 4.87
   - Probability of knock in < 12%

Continuing the trend …

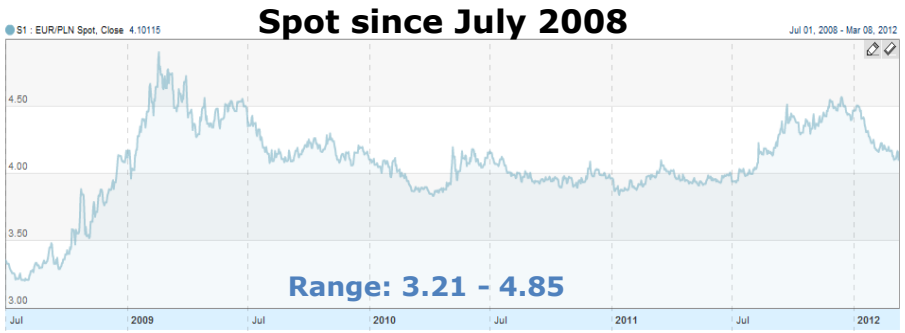
- Now the principle is clear it is a short step to other ‘flavours’ of the structures discussed:
  - Forward extra with partial barriers
    - Barriers only open for windows
  - Forward Knock Out
    - The entire forward disappears if the barrier is hit
  - Extendables
    - The forward extra only exists if on a given date a criteria is met

A bit more on Backtesting …

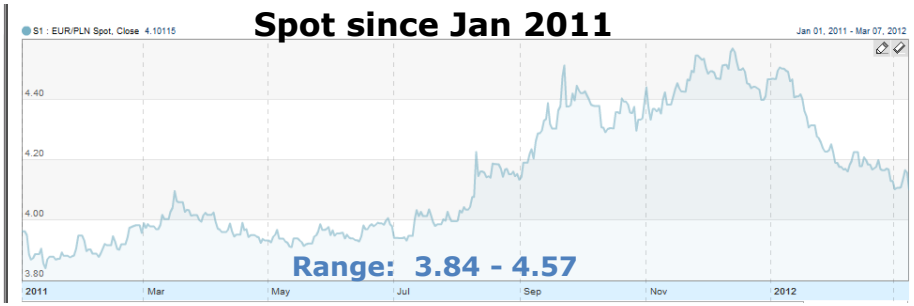
- Historical and future performance of each structure is dependent of course on the movement of the underlying during and at the end of market performance:

A bit more on Backtesting …

- Historical and future performance of each structure is dependent of course on the movement of the underlying during and at the end of each period:



Overall hedge performance* % versus spot			
	Max	Average	S Dev
Risk Reversal	11.2	4.7	5.1
US Forward Extra	25.0	2.5	4.7
Euro Forward Extra	18.5	2.7	4.6



Overall hedge performance* % versus spot			
	Max	Average	S Dev
Risk Reversal	11.2	4.85	4.6
US Forward Extra	16.42	5.15	5.06
Euro Forward Extra	16.42	5.15	5.06

** Hedge Performance measures the return of each strategy combining the strategy with a long position in EUR/PLN at the opening spot rate*

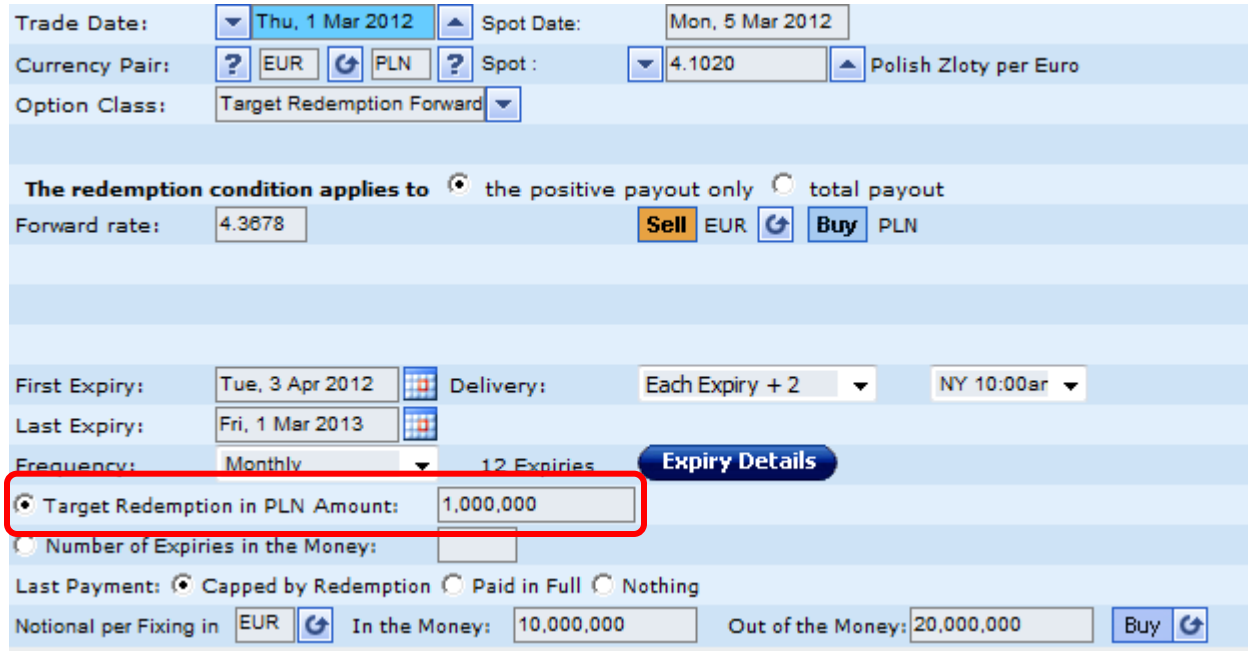
TARF – the ultimate alpha gatherer?

- Target Auto Redemption Forward
- The hedger enters into a strip of forwards (or participating forwards) at a favourable forward rate
- The whole structure is automatically terminated if and when the hedge accumulates a pre-defined amount of intrinsic value on the protection leg (i.e. the long leg)
- Risk? The hedge by definition disappears at the point when the client needs it most.

TARFs – example

Buys EUR Put €10m, sells EUR Call €20m
Both strikes 4.378, every month for 12 months, zero cost.

The structure is knocked out if the trade accumulates 10 big figures i.e. 1m Zloty.



TARFs – example

Buys EUR Put €10m, sells EUR Call €20m
Both strikes 4.38, every month for 12 months, zero cost.

The structure is knocked out if the trade accumulates 10 big figures i.e. 1m Zloty.

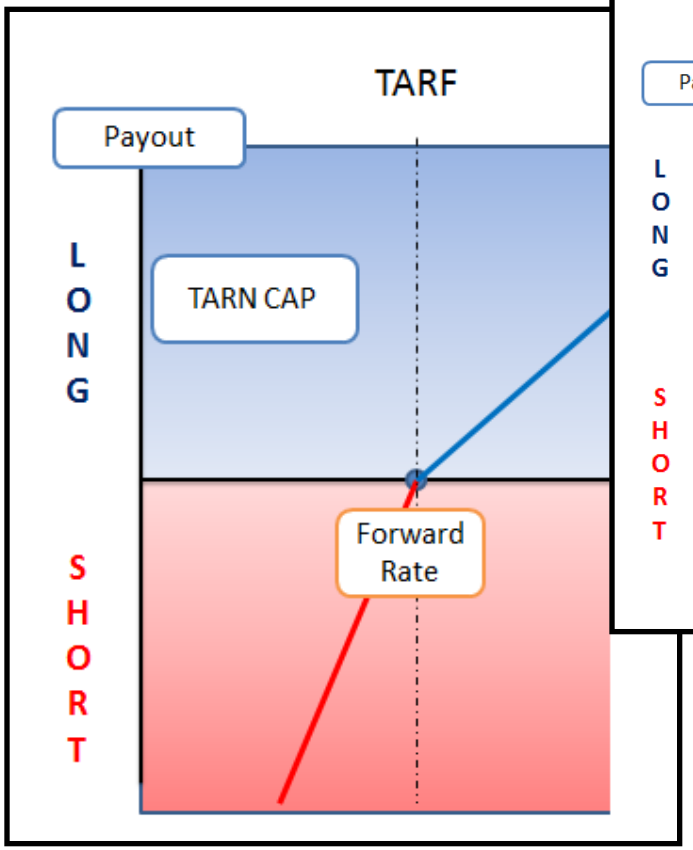
Fixing number	Fixing EUR/PLN	Intrinsic Value PLN (big figures)	Accumulated IV big figures
1	4.35	0.03 (3)	3
2	4.36	0.02 (2)	5
3	4.4	0	5
4	4.3	0.08	13
5	Terminated – no fixing		
6	Terminated – no fixing		

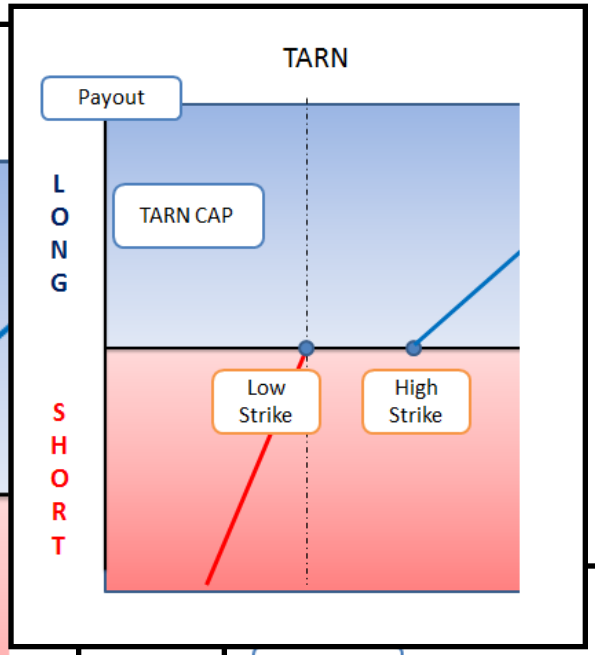
Structure redeemed early

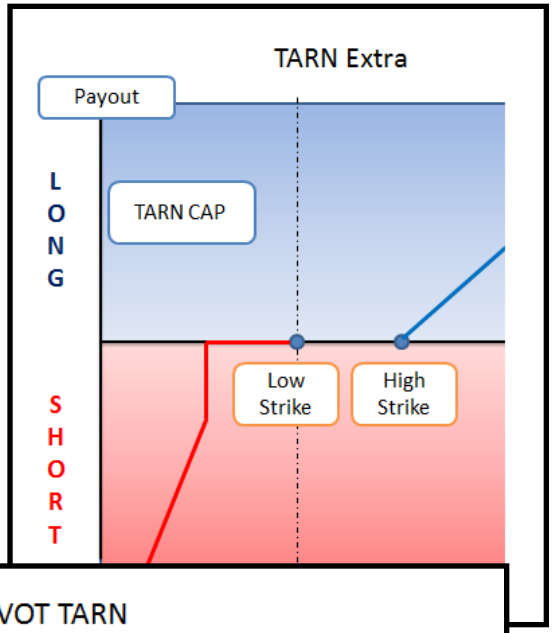
TARFs – example

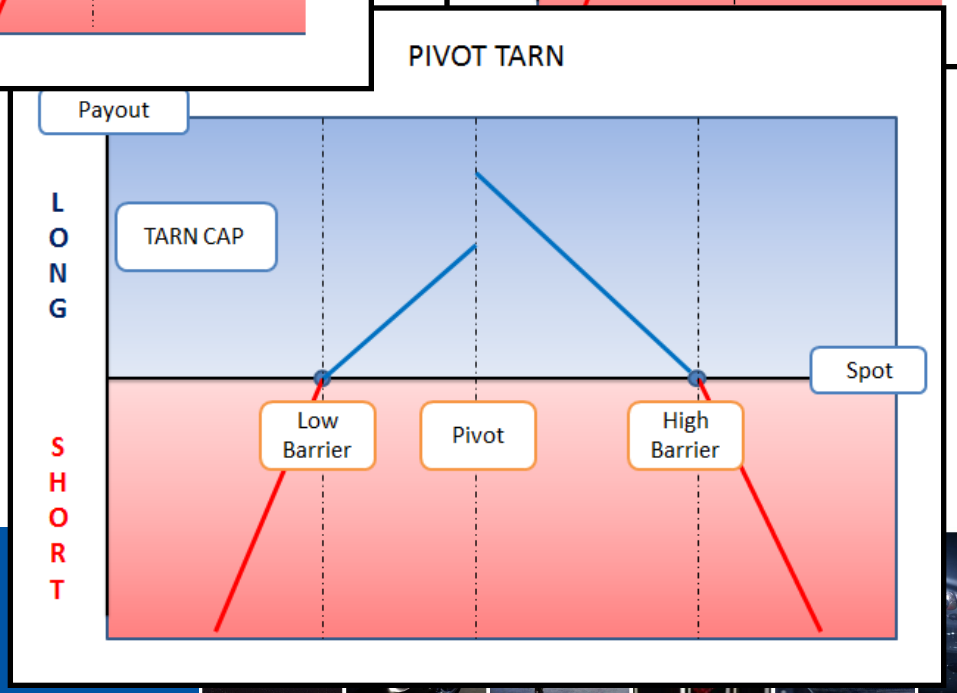
- Can they be used as a hedge?
  - ➢ Structure them as part of an overall hedging strategy
  - ➢ TARFs are likely to be redeemed early but be prepared for not being terminated i.e. to be locked in for the entire length of the structure
  - ➢ Provide benefit over other structures if you expect a flat exchange rate

TARF- other varieties









Summary

- Option strategies can be used to tailor a hedge to reflect a view on the future direction of spot
- An attractive structure should offer protection while offering a chance to benefit should your view on the market be correct
- The appropriate strategy to adopt will depend on a combination of:
  1. Expectations of future market moves
  2. Attitude to risk
  3. Internal targets and expectations
  4. Historical and future expected performance

THANK YOU

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