# **super**derivatives

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

## FX Hedging – the search for the "perfect" hedge

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#### Contents

- 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  $\rightarrow$  This is our benchmark
- 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 ...

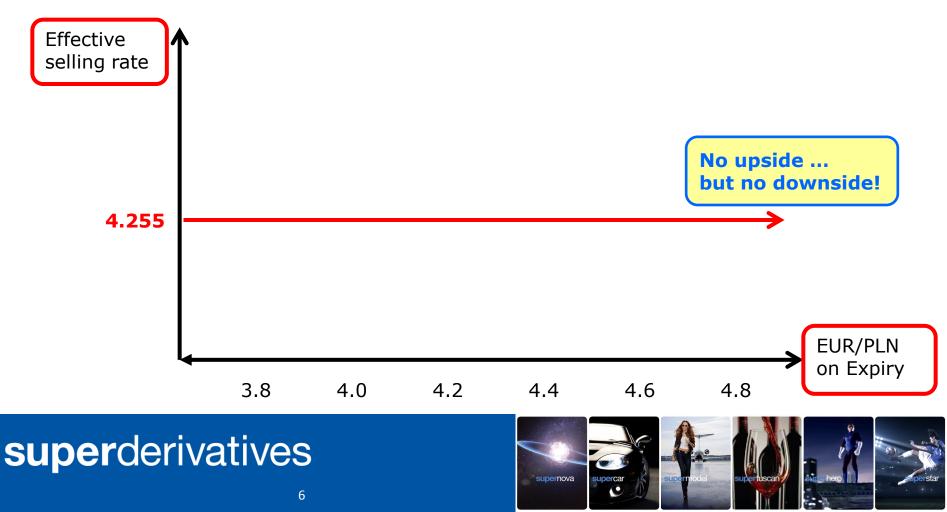


For example, you are Long EUR ...



### 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!

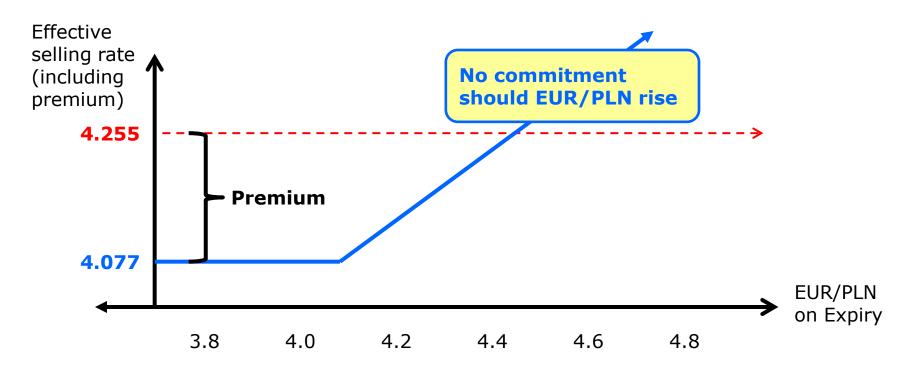
#### At the money forward EUR Put, premium 4.18%

supe	erderi	vatives		BAN	K SALES			FX	IR C	M EQ CD
Home T	irader Sal	es Structurer I	• Market Data	CC Risk Mgmt	Real Time	Execute	fx Analytics	Lan Help	SD) Abou	t Horiz/Vert
☆ Favorite	es 🕒 Rece	ent Shortcut free	text					×		ade F7 🤇 🧃
System menu	Find Strategy	Trade Date: Currency Pair: Option Class:	Thu, 1 Mail EUR G Vanilla	PLN ? S	pot Date:	Mon, 5 M		olish Zla	oty per Eur	ro
Back Testing	Structure Folder	Strike:	ATM Forward		EUR Put	t 🕑 PLN	I Call	S	Style: Eur	ropean 🔻
Term Sheet	Struct. Catalog	Expiry:	Fri, 1 Mar 2013	3 365	days; 12 m Volatility	nonth; Del B/A Spread		5 Mar 2(	013 NY	10:00ar 👻
Pricing Table	Who To Call	Fwd Points: Mid () 25Δ Bfly(%): EUR Depo(%):	0.1533425 0.770 1.120		Fwd Rate 25Δ RR(% PLN Depo	: %):	4.25534 4.000 4.916	Favor	EUR Call	PLN Put
Clients' Activity	CRM	Notional in EUR:	10,000,000 Risk Chart	Buy (		tional in PL Refresh Ra	.N: 42,553,00 tes F4	oo Clear	Dea	l Capture F6
Results EL	JR PLN	Details 🕂 🗖	Premium	WD Spot	Data: SD	B 🕨 A 🕨	B/A B/A	Mid	Req	uest Quote F8
	JR -52.		Margin: Trade	_	Amoun		?		Market Vo	
	JR - <mark>5,2</mark> buyEUR (	09,830 5,209,830		3.8368	3 / 4.178	86 %	5		0.10 / Breakeve 4.08	
Vega % EU	JR <b>0.39</b>	4 %			um in PLN				PLN p	
Vega in El	JR <mark>39,</mark> 3	91	1,	632,677	7 / 1,778	8,108		0.1	633 /	0.1778



#### 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

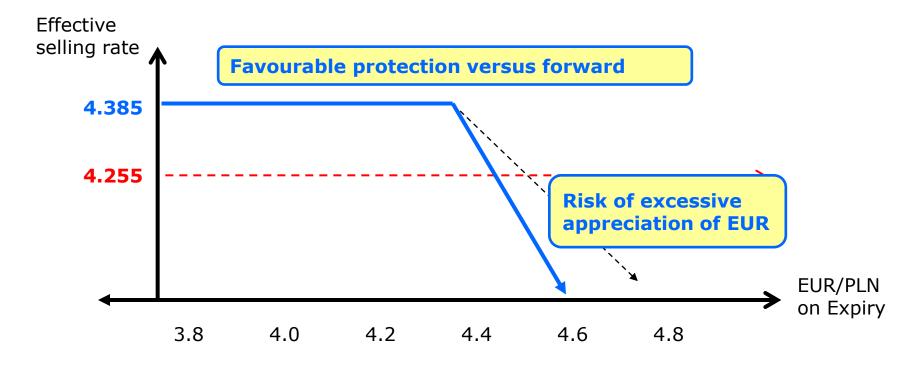
Trade Date:	👻 Thu, 1 Mar 2012 🏼	Spot Date: Mon, 5 Mar 2012
Currency Pair:	? EUR 👉 PLN	Spot : 💌 4.1020 🔺 Polish Zloty per Euro
Option Class:	Participating Forward	
Strike 1:	4.3850	EUR Put 👉 PLN Call Buy 👉
Strike 2:	4.3850	EUR Call 👉 PLN Put Sell 👉
Expiry:	Fri, 1 Mar 2013 🚺 3	365 days; 12 month; Delivery: Tue, 5 Mar 2013 NY 10:00ar 👻
ATM Vol:	10.400	Volatility B/A Spread: 0.900
Fwd Points: Mid 👉	0.1533425	Fwd Rate: 4.25534
25∆ Bfly(%):	0.770	254 RR(%) EUR Call 👉 PLN Put
EUR Depo(%):	1.120	
Notional 1 EUR:	10,000,000	Notional 2 EUR: 20,000,000 In: EUR 🕼

• 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

Trade Date:	👻 Thu, 1 Mar 201	12 🔺 Spot Date:	Mon, 5 Mar	2012				
Currency Pair:	? EUR 👉 PL	N ? Spot :	<b>4</b> .1020	🔺 Polish Zlo	ty per Euro			
Option Class:	Risk Reversal	-						
Strike 1:	4.1020	]	EUR Put	PLN Call Buy	G			
Strike 2:	4.5620	]	EUR Call	PLN Put Sell	G			
Expiry:	Fri, 1 Mar 2013	365 days; 12	2 month; Deliv	very: Tue, 5 Mar 20	13 NY 10:00ar	-		
ATM Vol:	10.400	Volatili	ity B/A Spread:	0.900				
Fwd Points: Mid 👉	0.1533425	Fwd Ra	ate:	4.25534				
25∆ Bfly(%):	0.770	254 RI	R(%):	4.000 Favor B	EUR Call 👉 PLI	N Put		
EUR Depo(%):	1.120	PLN De	epo(%):	4.916				
						_	ew and	
Notional 1 EUR:	10,000,000	]	Notional 2 EUR	: 10,000,000	In: EUR 👉	foi	rward	
		-				ро	ints favour	

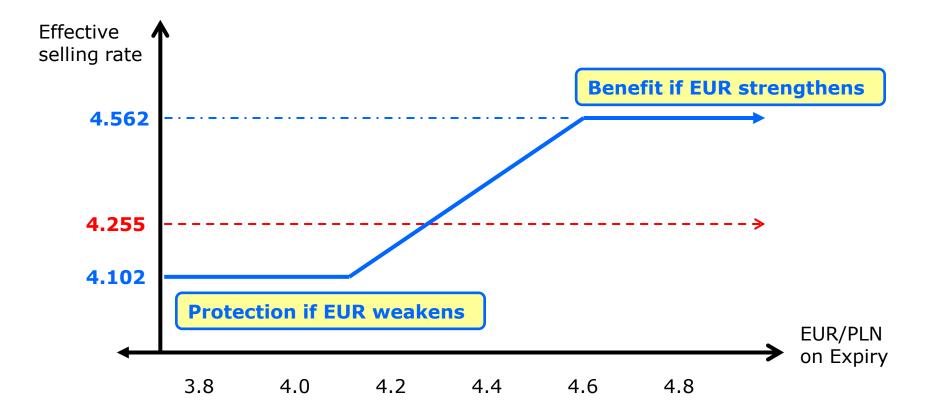
Give up 15 big figures of protection versus forward to potentially earn 31 big figures

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

superde	superderivatives Pricing Table							
Option Descri	Option Description: Risk Reversal							
Scenario 1 +								
Horizontal:	Option1	▼ Strike	•					
Use Solver	Option2	▼ Strike	•	For: Offer Pr	ice in %	▼ = 0	EUR 😉	
							Calculate: Strike	
	Strike							
Tenor	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 <u>same strike</u> 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 <u>unfavourable</u> strike

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



#### Buy EUR Put at 4.102 (Spot)

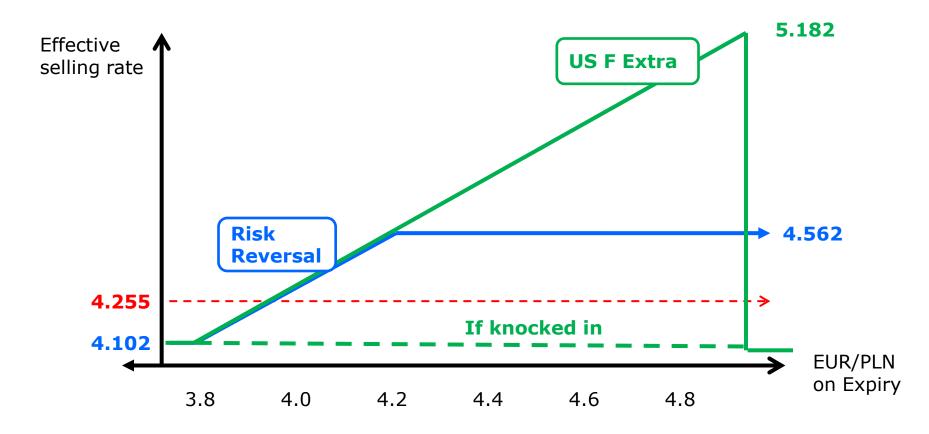
#### Sell EUR Call at 4.102 with US knock in at 5.182, Zero Cost

Trade Date:	💌 Thu, 1 Mar 2012	Spot Date:	Mon, 5 Mar 2	2012
Currency Pair:	? EUR 👉 PLN	? Spot :	<b>4</b> .1020	<ul> <li>Polish Zloty per Euro</li> </ul>
Option Class:	Forward Extra	-		
Fwd rate(strike):	4.1020		Vanilla: EUR	R Put 🕑 PLN Call Buy 👉
Knock In Trigger:	5.1824		RKI: EUF	R Call 👉 PLN Put Sell 👉
Expiry:	Fri, 1 Mar 2013	👖 365 days; 12	month; Delive	ery: Tue, 5 Mar 2013 NY 10:00ar 💌
ATM Vol:	10.400	Volatilit	y B/A Spread:	0.900
Fwd Points: Mid 👉	0.1533425	Fwd Ra	te:	4.25534
25∆ Bfly(%):	0.770	254 R.R	(%):	4.000 Favor EUR Call 👉 PLN Put
EUR Depo(%):	1.120	PLN De	po(%):	4.916
Notional in EUR:	10,000,000	1	Notional in PLN:	41,020,000

• 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





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





• <u>Historically</u>, 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





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

superderivatives	Pricing Table			
		Interrupt	Calculate F2 Export To Ex	ccel ?
Option Description: Buy One Touch EUR	L / PLN trigger	th PDF		
Horizontal: One Touch Trigg	er 🔻			
Vertical: Tenor	•			
Results: Market Price	▼ % 🕑 PLN 🔮		(Mid E	Bid Ask
One Touch Trigger				
Tenor 5.66	5.62 5.58	5.53 5.48	5.38 5.1	18
1m 0.109	0.109 0.109	<sup>0.109</sup> 12.75% pro	bability of hittin	g T
3m 0.250	0.250 0.375		he next year	
6m 3.001	3.001 3.127	3.253 according t	o option prices	
1y 6.500	6.750 7.250	7.875 8.500	9.875 12.7	750



#### There's more than one Forward Extra

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

Option Descrip	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 P	rice in %	• = 0	EUR 😉
							Calculate: Trigger
	Strike						
Tenor	3.94	3.96	3.98	4.00	4.02	4.05	4.102
1у	5.6623	5.6218	5.5796	5.5352	5.4771	5.3815	5.1824
		Gain or	loss versus	forward in bi	g 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

Trade date:	Trade date: Thu, 1 Mar 2012 A Spot date:						
Currency pair:	? EUR & PLN	<b>?</b> 🕶 4.1020 🔺					
Select Options	Option 1 Data	Option 2 Data					
Option Class:	vanila 👻	european knock in 👻					
Call / Put:	EUR Put 🕑	EUR Call					
Strike:	4.102	4.102					
Trigger 1:		4.8702 Above					
Trigger 2:		ki above 4.8702					
Expiry:	Fri, 1 Mar 2013 🔢	Fri, 1 Mar 2013					
Delivery:	Tue, 5 Mar 2013	Tue, 5 Mar 2013					
Volatility ATM 🕑 :	10.400	10.400					
Fwd Mid 👉 :	0.1533425	0.1533425					
25Δ RR (%):	4.000 EUR Call 👉	4.000 EUR Call 👉					
25∆ Bfly (%):	0.770	0.770					
Notional in EUR 👉 :	Buy 10,000,000	Sell 10,000,000					

 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 <u>spot price on expiry</u> is above/below a predefined barrier.
- The mid-price of these options therefore gives the implied probability of expiring above/below the barrier.

<b>super</b> de	rivatives	Pricing 1	able					
Option Description:       Buy European Digital EUR / PLN trigger above 5.5500 Expiry 359 days payout in PLN         Scenario 1       +         Horizontal:       Strike    Vertical: Tenor Inter European barriers only exist on expiry, therefore they are less likely to knock in than a US barrier								
Results:	Market Price		% 🕑 EUR 🕑				(Mid Bid Ask)	
Tenor	Strike	5.24	5.16	5.09	5.03	4.97	4.87	
1m	0.125	0.125	0.125	0.125	0.125	0.125	0.125	
3m	0.125	0.126					3.822	
6m	3.810	4.091		6 probabil			6.250	
1γ	6.125	6.250	above	4.87 in on	e years	time	11.125	



### There's more than one Euro Forward Extra too!

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

superde	rivatives	Pricing 1	able						
					Interrupt	Calculate F2 E	xport To Excel ?		
Option Descrip	Option Description: Buy European Forward Extra Put EUR Call PLN								
Horizontal:	Option1	▼ Strike		▼ Vertical:	Option1	▼ Tenor			
Use Solver	Option2	▼ Trigger		▼ For: Offer P	rice in %	▼ = 0	EUR 🕑		
							Calculate: Trigger		
	Strike								
Tenor	3.94	3.96	3.98	4.00	4.02	4.05	4.102		
1γ	5.2935	5.2372	5.1609	5.0905	5.0253	4.9724	4.8702		
		Gain c	or loss versu	is forward in bi	ig figures				
Downside	-31	-29	-27	-25	-23	-20	-15		
Upside	104	98	91	84	77	72	62		

7.0%

8.0%

6.6%



9.1%

11.1%

6.2%

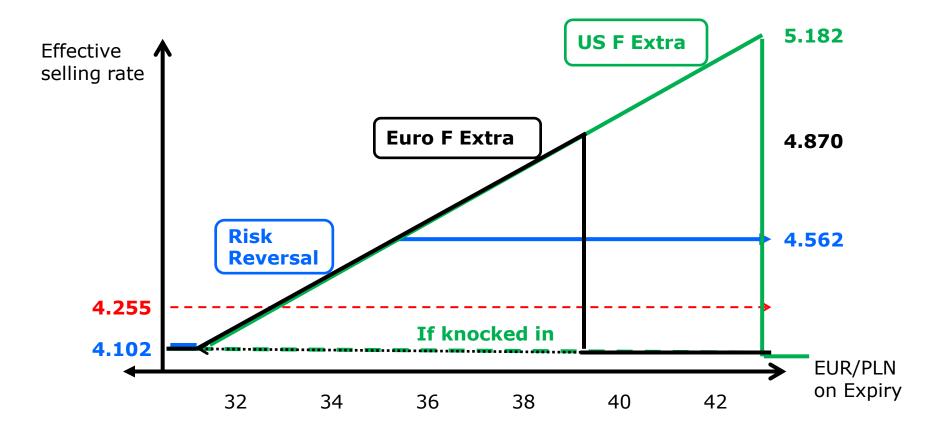
6.1%

superderivatives

Implied

trigger %

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%</li>

#### or

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



#### 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:

<b>super</b> derivatives		Historic	al Analysis		
_					
Scale back to 100% on date: Th	u, 7 Mar 2002 🔛 🤇 Ca	Iculate Undo			Print
S1 : EUR/PLN Spot, Close 4.05825	1		1		Jun 13, 2005
5.00	A., 1	0 year EUR	PLN	L.	
4.50				Min	L.M.
4.00	The share			my Junting little	M N
		man	my V	and the second s	www
3.50			With		
3.00			~~~		
	2004	2006	2008	2010	



### 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					

S1 : EUR/PLN Spot, Close 4.10115	Spot since Jan 2011	Use 01, 2011 - Mar 97, 2012				s spot
4.40	1 mar			Max	Average	S Dev
4.20		m	Risk Reversal	11.2	4.85	4.6
4.00	manna		US Forward Extra	16.42	5.15	5.06
3.80 2011 Mar	Range:         3.84 - 4.57           May         Jul         Sep         Nov         2012		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 <u>automatically terminated</u> 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.

Trade Date:	Thu, 1 Mar 2012 A Spot Date: Mon, 5 Mar 2012
Hade Date:	apprilate.
Currency Pair:	? EUR 👉 PLN ? Spot : 💌 4.1020 🔺 Polish Zloty per Euro
Option Class:	Target Redemption Forward
The redemption	condition applies to $ \odot $ the positive payout only $ \odot $ total payout
Forward rate:	4.3878 Sell EUR 👉 Buy PLN
First Expiry:	Tue, 3 Apr 2012 Delivery: Each Expiry + 2 - NY 10:00ar -
Last Expiry:	Fri, 1 Mar 2013
Frequency:	Monthly - 12 Expiries Expiry Details
Target Redempti	on in PLN Amount: 1,000,000
O Number of Expirit	ies in the Money:
Last Payment: 🖲 🕻	Capped by Redemption $ ext{O}$ Paid in Full $ ext{O}$ Nothing
Notional per Fixing i	n EUR 👉 In the Money: 10,000,000 Out of the Money: 20,000,000 Buy 👉



#### 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	Structure	
4	4.3	0.08	13	redeemed early	
5					
6					



#### TARFs – example

• Can they be used as a hedge?

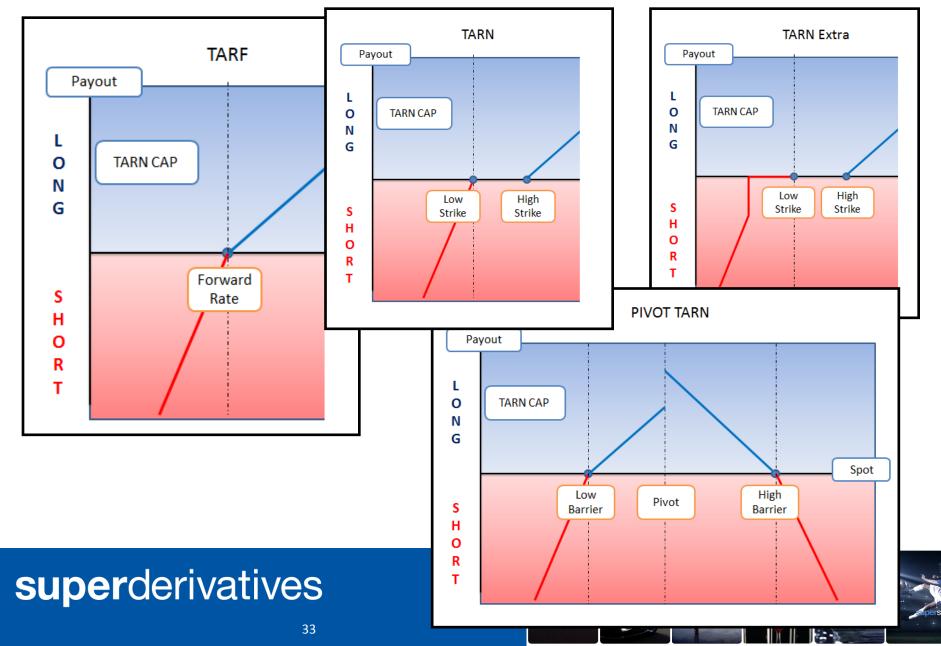
Structure them as part of an overall hedging strategy

- 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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