Foreign Exchange: Markets, Products, and Pricing

Winter Quarter 2023

Week #5

Problem #25 Delta-Neutral Strike

- There is a strike rate where a call and put have offsetting deltas, $P_S + C_S = 0$
- This is called the "delta-neutral" strike, since a combination of long call and long put both at this strike will have a net delta of zero
- Use the Black-Scholes formula for Call + Put, differentiate with respect to the spot rate, set the result = 0 and derive a formula for the strike. Then use the market information below to calculate the strike:

Currency pair NZDUSD

Spot rate 0.6257

Trade date 2-Mar-2023

Expiry date 4-Sep-2023

Spot date 6-Mar-2023

Delivery date 6-Sep-2023

USD deposit rate 4.75%

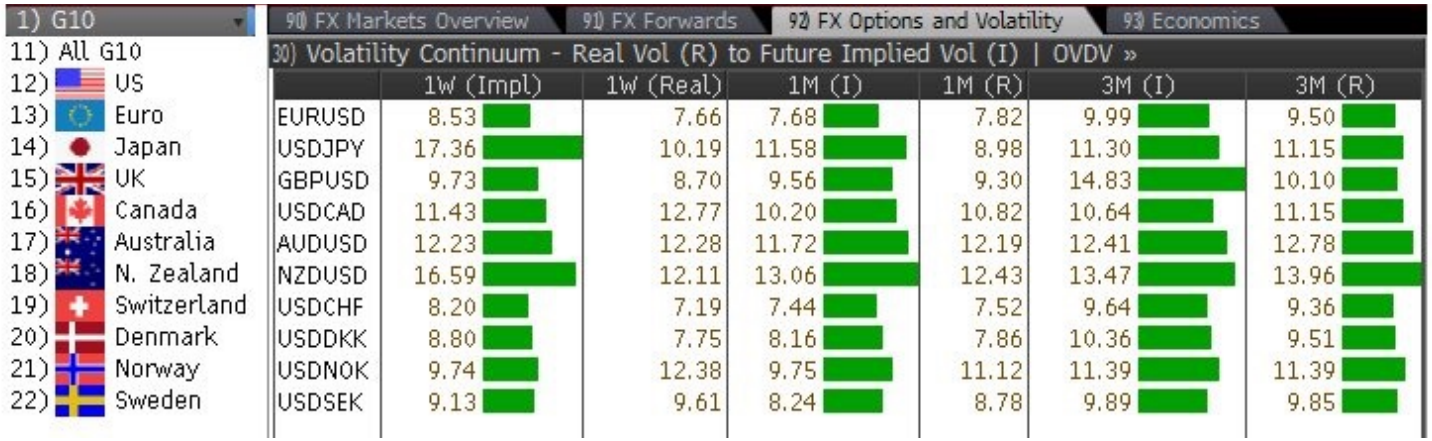
NZD deposit rate 4.40%

Implied volatility 12.15%

The volatility surface

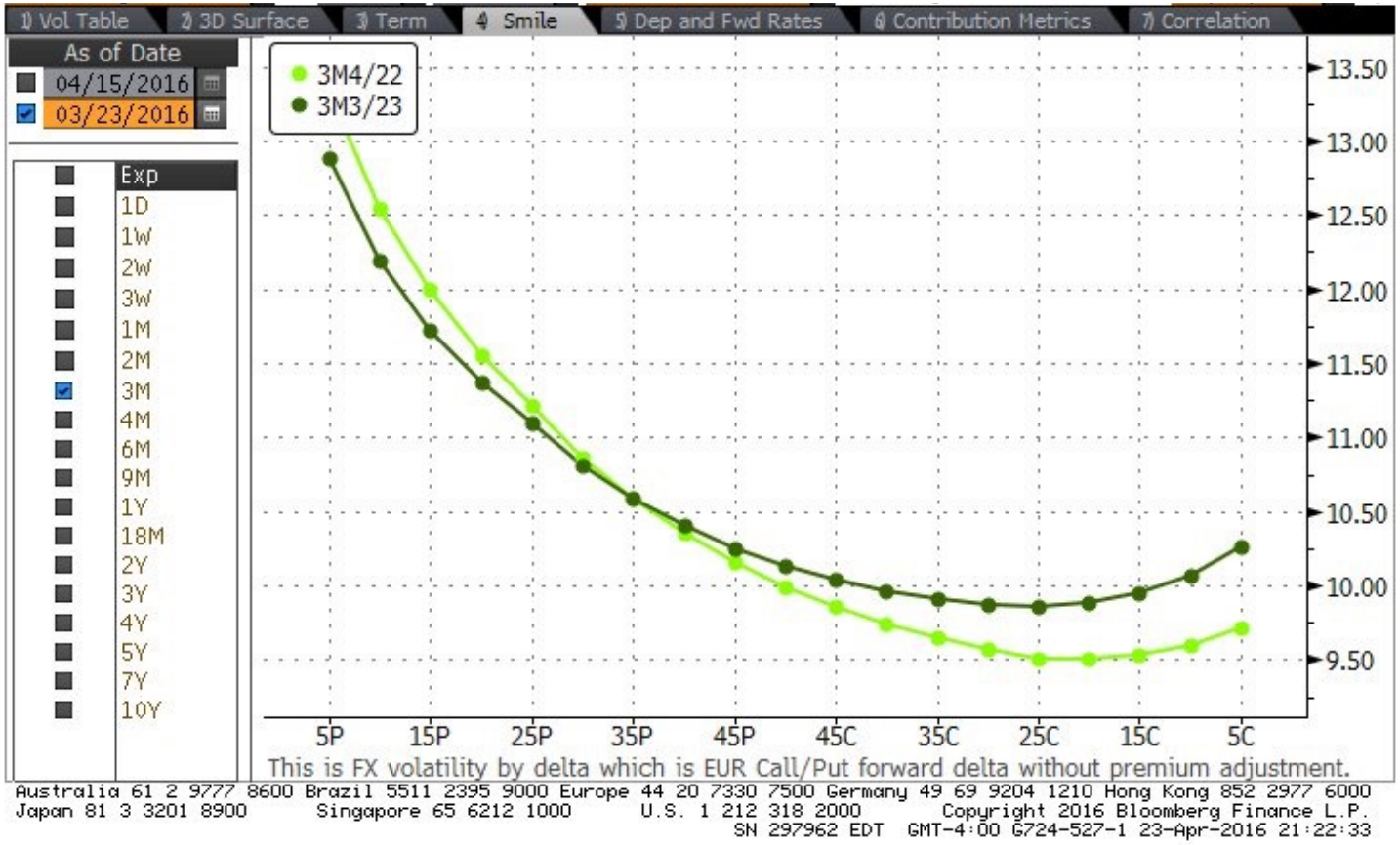
Implied and realized volatility

- Note that in practice implied volatility can vary significantly from the recently observed volatility of the underlying spot rate



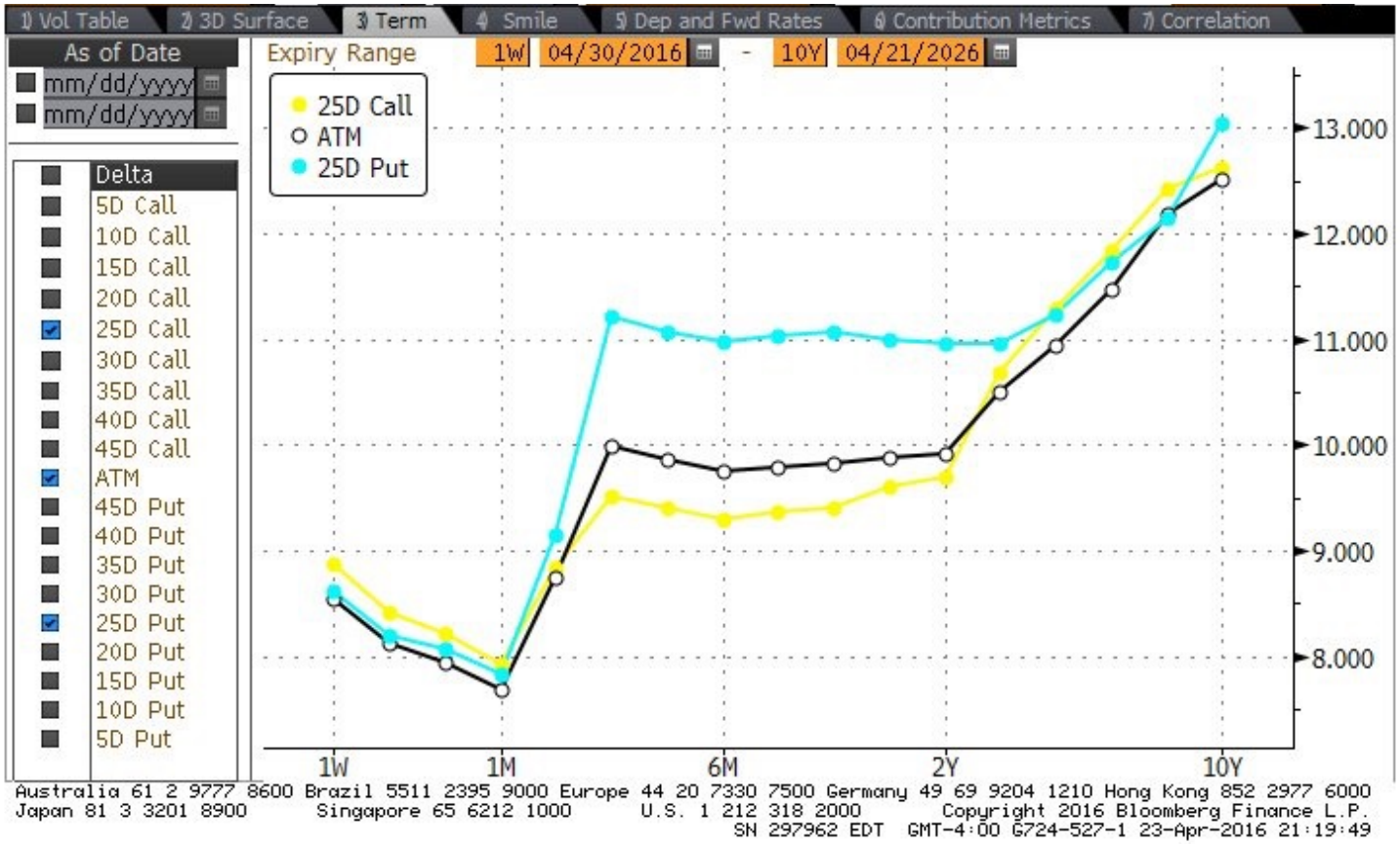
	1W (Impl)	1W (Real)	1M (I)	1M (R)	3M (I)	3M (R)
EURUSD	8.53	7.66	7.68	7.82	9.99	9.50
USDJPY	17.36	10.19	11.58	8.98	11.30	11.15
GBPUSD	9.73	8.70	9.56	9.30	14.83	10.10
USDCAD	11.43	12.77	10.20	10.82	10.64	11.15
AUDUSD	12.23	12.28	11.72	12.19	12.41	12.78
NZDUSD	16.59	12.11	13.06	12.43	13.47	13.96
USDCHF	8.20	7.19	7.44	7.52	9.64	9.36
USDDKK	8.80	7.75	8.16	7.86	10.36	9.51
USDNOK	9.74	12.38	9.75	11.12	11.39	11.39
USDSEK	9.13	9.61	8.24	8.78	9.89	9.85

Implied volatility smile – with change over one month's time



Implied volatility by option tenor

Implied volatility by option tenor – for varying strikes/deltas



Implied volatility surface

1) Vol Table | 2) 3D Surface | 3) Term | 4) Smile | 5) Dep and Fwd Rates | 6) Contribution

Format ■ RR/BF ● Put/Call Side ● Bid/Ask ■ Mid/Spread

	ATM	25D Call EUR	25D Put EUR	10D Call EUR	10D Put EUR
Exp	Bid / Ask	Bid / Ask	Bid / Ask	Bid / Ask	Bid / Ask
1D	3.630 / 6.340	3.467 / 6.950	3.256 / 6.746	2.179 / 8.946	1.783 / 8.592
1W	8.050 / 9.020	8.265 / 9.485	8.010 / 9.230	8.285 / 10.502	7.852 / 10.070
2W	7.785 / 8.455	8.002 / 8.843	7.782 / 8.623	8.100 / 9.628	7.742 / 9.270
3W	7.690 / 8.205	7.889 / 8.536	7.749 / 8.396	8.070 / 9.243	7.797 / 8.970
1M	7.495 / 7.870	7.689 / 8.161	7.594 / 8.066	7.938 / 8.792	7.713 / 8.567
2M	8.555 / 8.950	8.588 / 9.084	8.891 / 9.387	8.740 / 9.640	9.245 / 10.145
3M	9.765 / 10.215	9.227 / 9.793	10.932 / 11.498	9.090 / 10.115	12.030 / 13.055
6M	9.555 / 9.930	9.062 / 9.533	10.742 / 11.213	9.075 / 9.930	12.005 / 12.860
1Y	9.670 / 9.970	9.222 / 9.598	10.882 / 11.258	9.359 / 10.041	12.249 / 12.931
18M	9.725 / 10.050	9.392 / 9.800	10.795 / 11.203	9.573 / 10.312	12.133 / 12.872
2Y	9.745 / 10.095	9.469 / 9.908	10.737 / 11.176	9.704 / 10.501	12.000 / 12.795
3Y	10.175 / 10.810	10.288 / 11.085	10.565 / 11.362	10.693 / 12.139	11.236 / 12.681
5Y	11.130 / 11.800	11.424 / 12.266	11.299 / 12.141	11.930 / 13.455	11.770 / 13.295
7Y	11.940 / 12.440	12.114 / 12.741	11.839 / 12.466	11.996 / 13.134	11.496 / 12.634
10Y	12.190 / 12.840	12.212 / 13.028	12.637 / 13.453	11.788 / 13.267	12.563 / 14.042

Implied Distributions (Breeden-Litzenberger Analysis)

- For a fixed maturity date, T
  - A continuum of call prices across strikes, K, is equivalent to
  - An implied distribution (under the risk-neutral density) for the spot rate, S
- Derivation:
  - Call price as a function of strike, $C(K) = P^d * E^Q[\ \max(0, S_T - K)\ ]$
  - Let $f^Q(K)$ be the probability density function
  - With some additional derivation we can see that

$$\frac{\partial}{\partial K} C(K) = P^d * \frac{\partial}{\partial K} \int_K^\infty (s-K) f^Q(s) ds = -P^d * \int_K^\infty f^Q(s) ds$$

  - Differentiating a second time leads to the Breeden-Litzenberger formula

$$f^Q(K) = (1/P^d) * \frac{\partial^2}{\partial K^2} C(K)$$

Straddle, risk reversal, butterfly (ATM, RR, BF)

Frequently traded FX option structures

- Three frequently traded option combinations
- Used by option traders to manage risk
  - Straddle "***STDL***"

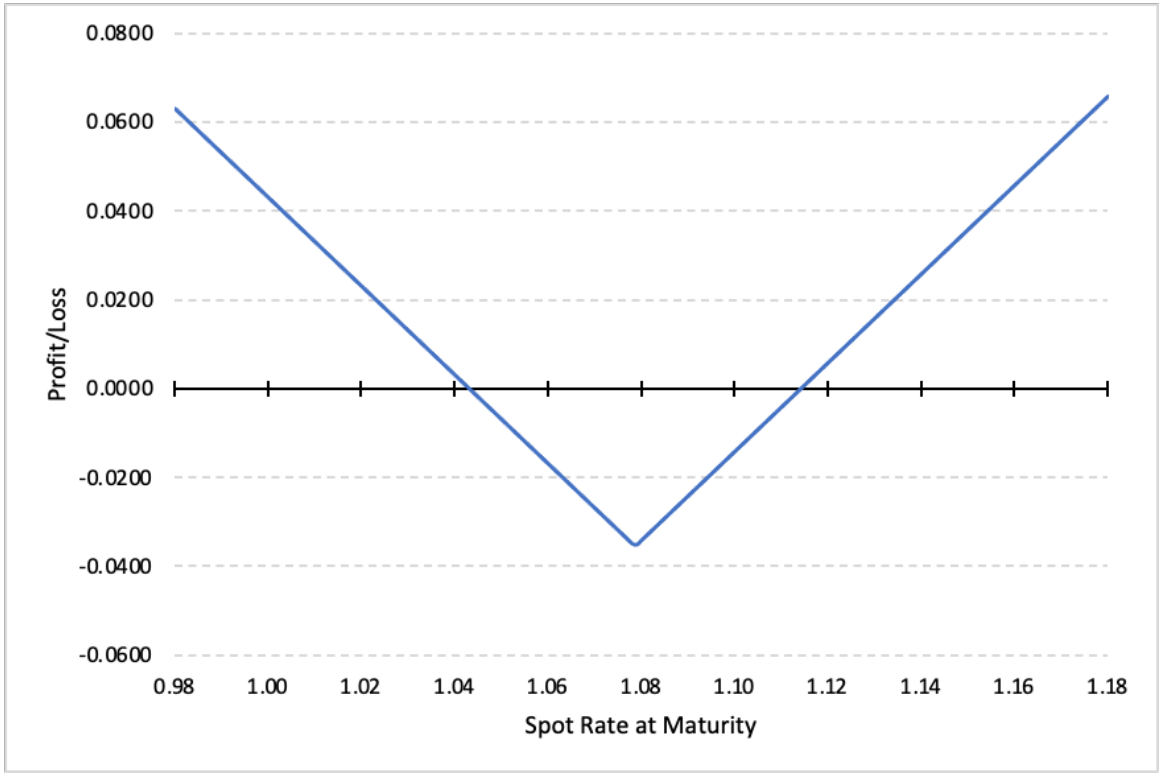
    +1 Call +1 Put, at-the-money (either delta-neutral or or forward, depending on the currency pair)
  - Risk reversal "***RR***"

    +1 Call -1 Put, 25 delta
  - Butterfly "***VWB***"

    +1 Call +1 Put (STDL) and -1 Call -1 Put, 25 delta, "vega-weighted"

Straddles

- Straddle "***STDL***" : *+1 Call +1 Put, at-the-money*



Straddles

- "At-the-money straddle", buy a base currency call and a base currency put "at the money". Depending on the currency pair, this can be either the "delta-neutral strike" ***(DNS)***, *or* "at the forward rate" ***(ATMF)***

Example

- 1M EURUSD [straddle] in 50 *(price request from an options trader)*
- > 8.1 8.3 *(response from a market-making counterparty)*
- 8.3, spot ref 1.4575 *(trader buys the straddle at 8.30% implied volatility)*
- Note, the trader will buy both a 25m EUR call and 25m EUR put at a strike calculated so that the call and put have equal deltas (of opposite signs)
- No delta hedge will be exchanged between the counterparties

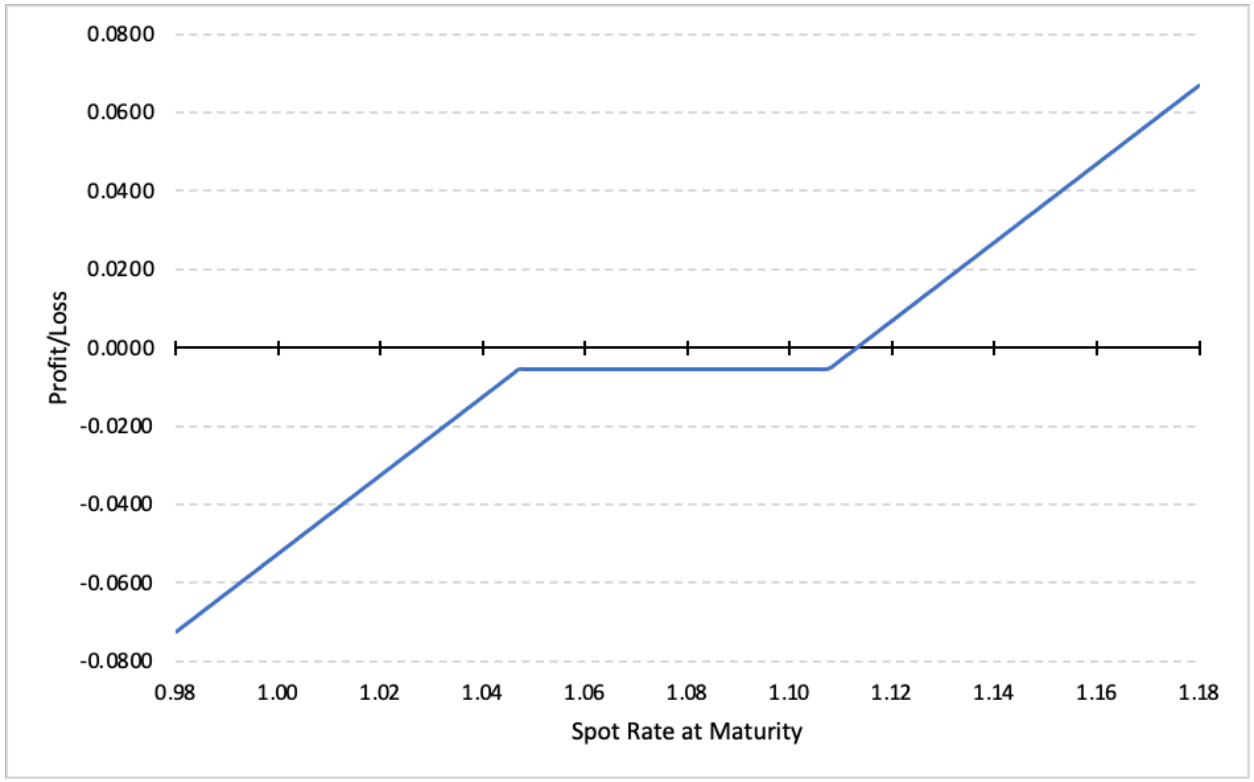
Straddles

- Market convention for the currency pair will determine whether DNS or ATMF applies
  - Often emerging market currency traders will prefer ATMF straddles, otherwise DNS

- Note that delta is calculated using Black-Scholes
  - A DNS straddle may have a non-zero delta under less simple pricing assumptions

Risk Reversals

- Risk reversal "***RR***" : *+1 Call -1 Put, 25 delta*



Risk Reversals

- "Risk reversal", buy a base currency call and sell a put, typically 25 delta (of opposite signs)
- "Risk reversal" will also denote the difference in implied volatility between a 25 delta call and put
  - Sometimes negative numbers indicate puts have higher implied volatility
  - Sometimes traders will assume this direction is known (or will specify "puts")

Risk Reversals – Example

USDJPY 6M 25d RR in 100 *(price request from an options trader)*

> 1.7 1.8 puts *(response from a market-making counterparty)*

OR, > -1.8 -1.7 *(negative specifies that puts have higher implied volatility)*

OR, > 1.7 1.8 *(assuming that both trader and market-maker know puts are "preferred")*

> 1.7, spot ref 108.35 *(trader sells the risk reversal, with puts preferred, at a 1.70% implied volatility spread)*

> vols 11.85 10.15 *(market-maker indicates implied volatility for the put and call, in that order since puts are preferred. Here ATM volatility is assumed to be 11.00% because half the 1.70% risk reversal spread will be added/subtracted to the ATM volatility to determine the put/call implied volatility)*

Risk Reversals – Example (continued)

USDJPY 6M 25d RR in 100 *(price request from an options trader)*

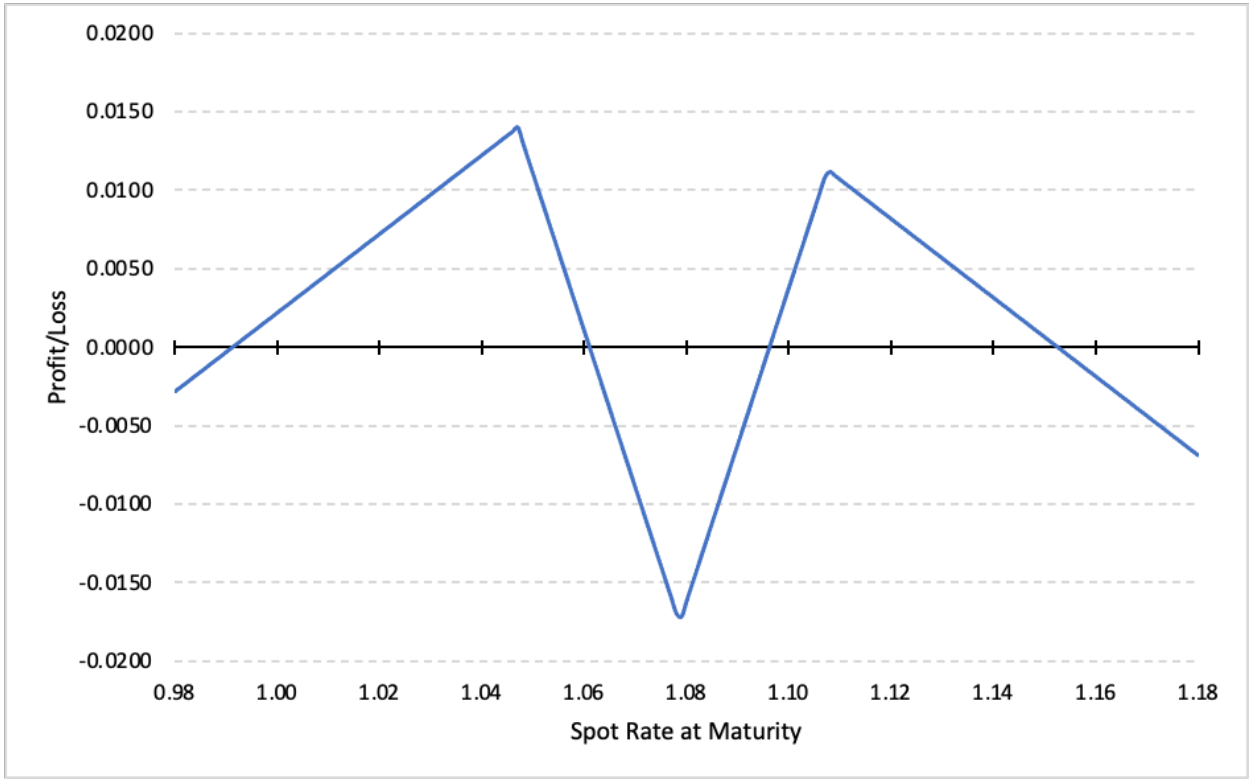
> 1.7, spot ref 108.35 *(trader sells the risk reversal, with puts preferred, at a 1.70% implied volatility spread)*

> vols 11.85 10.15 *(market-maker indicates implied volatility for the put and call, in that order since puts are preferred. Here ATM volatility is assumed to be 11.00% because half the 1.70% risk reversal spread will be added/subtracted to the ATM volatility to determine the put/call implied volatility)*

- Note, the trader will buy 100m of the USD call at 10.15% implied volatility and sell 100m of the USD put at 11.85% implied volatility
- Delta will be exchanged, the trader will sell 50m USD at the reference rate 108.35

Butterfly

- Butterfly "***VWB***" : *+1 STDL and -1 Call -1 Put, 25 delta, "vega-weighted"*



Butterfly

- "Butterfly", buy a call and put (a "strangle"), typically 25 delta, and sell an at-the-money straddle
- "Fly" or "BF" will also denote the difference in implied volatility between
  - Average of [25 delta] call and put (a.k.a., "the wings") - At-the-money volatility
  - Typically a positive number. *Negative* quote always means the "wings" are *lower*
  - The traded structure is usually "vega weighted": the strangle notional will be larger than the straddle notional, with proportions to create equal and offsetting vega (sensitivity to volatility)

Butterfly – Example

EURJPY 1y 25d fly in 250 *(price request from trader, 250m EUR per leg of straddle)*

> 0.275 0.375 *(response from a market-making counterparty)*

0.375, spot ref 158.25 *(trader buys the butterfly, buying the strangle and selling the straddle, with implied volatility for the strangle 0.375% higher than implied volatility for the straddle)*

> vol for ATM 10.90 *(market-maker indicates implied volatility of 10.90% for the straddle)*

Butterfly – Example (continued)

EURJPY 1y 25d fly in 250

0.375, spot ref 158.25

> vol for ATM 10.90

- Note, the trader will:
  - sell 250m per leg of the ATM (typically DNS) straddle at 10.90% implied volatility, and
  - buy a 25 delta call and 25 delta put both at 11.275% implied volatility
- The notional will be increased to make the entire transaction vega neutral (under the Black-Scholes model with the specified implied volatilities)
- Assumed to be both delta-neutral and vega-neutral for dealing purposes

Implied volatility surface – with RR and BF

1) Vol Table | 2) 3D Surface | 3) Term | 4) Smile | 5) Dep and Fwd Rates | 6) Contribution

Format ● RR/BF ○ Put/Call Side ● Bid/Ask ○ Mid/Spread

	ATM	25D RR	25D BF	10D RR	10D BF
Exp	Bid / Ask	Bid / Ask	Bid / Ask	Bid / Ask	Bid / Ask
1D	3.630 / 6.340	-0.740 / 1.155	-0.555 / 0.795	-1.250 / 2.000	-0.695 / 1.475
1W	8.050 / 9.020	-0.085 / 0.595	-0.030 / 0.455	-0.150 / 1.015	0.255 / 1.030
2W	7.785 / 8.455	-0.015 / 0.455	0.025 / 0.360	-0.045 / 0.760	0.295 / 0.835
3W	7.690 / 8.205	-0.040 / 0.320	0.065 / 0.325	-0.040 / 0.585	0.365 / 0.780
1M	7.495 / 7.870	-0.035 / 0.225	0.100 / 0.290	0.000 / 0.450	0.420 / 0.720
2M	8.555 / 8.950	-0.440 / -0.165	0.135 / 0.335	-0.740 / -0.270	0.530 / 0.850
3M	9.765 / 10.215	-1.860 / -1.550	0.260 / 0.485	-3.210 / -2.670	0.905 / 1.260
6M	9.555 / 9.930	-1.810 / -1.550	0.300 / 0.490	-3.155 / -2.705	1.075 / 1.375
1Y	9.670 / 9.970	-1.765 / -1.555	0.345 / 0.495	-3.070 / -2.710	1.205 / 1.445
18M	9.725 / 10.050	-1.515 / -1.290	0.330 / 0.490	-2.755 / -2.365	1.205 / 1.465
2Y	9.745 / 10.095	-1.390 / -1.145	0.315 / 0.490	-2.505 / -2.085	1.190 / 1.470
3Y	10.175 / 10.810	-0.500 / -0.055	0.175 / 0.490	-0.925 / -0.160	0.940 / 1.450
5Y	11.130 / 11.800	-0.110 / 0.360	0.150 / 0.485	-0.245 / 0.565	0.880 / 1.415
7Y	11.940 / 12.440	0.100 / 0.450	-0.025 / 0.225	0.200 / 0.800	-0.075 / 0.325
10Y	12.190 / 12.840	-0.650 / -0.200	0.155 / 0.480	-1.165 / -0.385	0.140 / 0.660

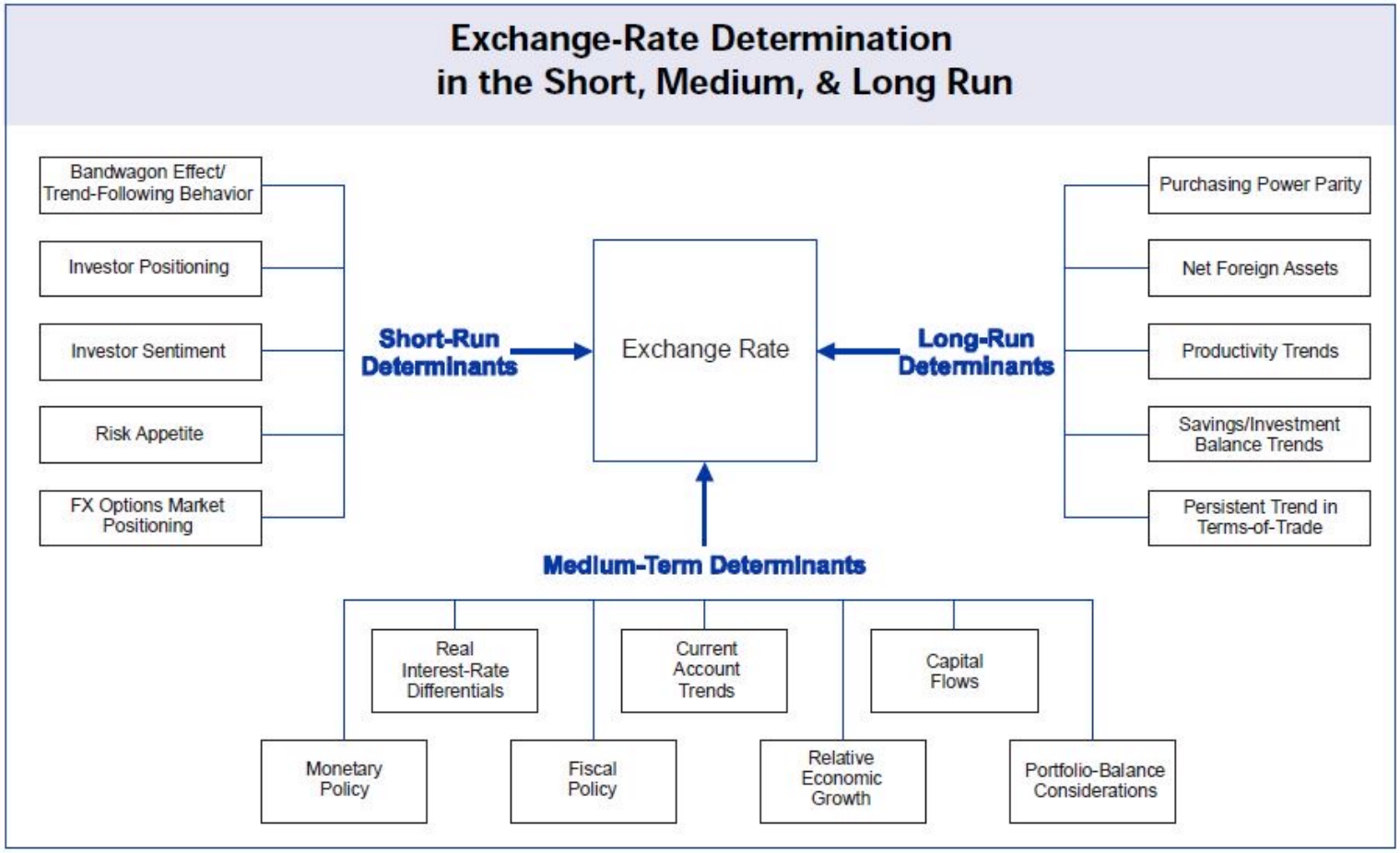
Exchange rate determination

See Canvas

Files > Supplementary Material > FX Valuation

DB - 2002 - The Deutsche Bank guide to exchange rate determination

Exchange rate determination

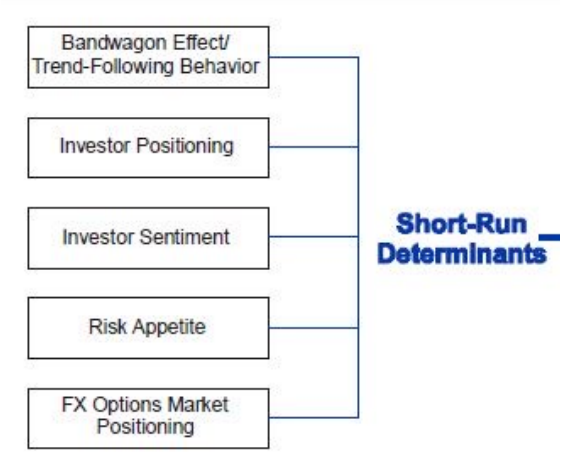


- Fundamental trading strategies: Carry, momentum and valuation

Exchange rate determination

Short-run determinants

- Trend-following behavior (among investors)
- Investor positioning
- Investor sentiment
- Risk appetite
- FX Options market positioning

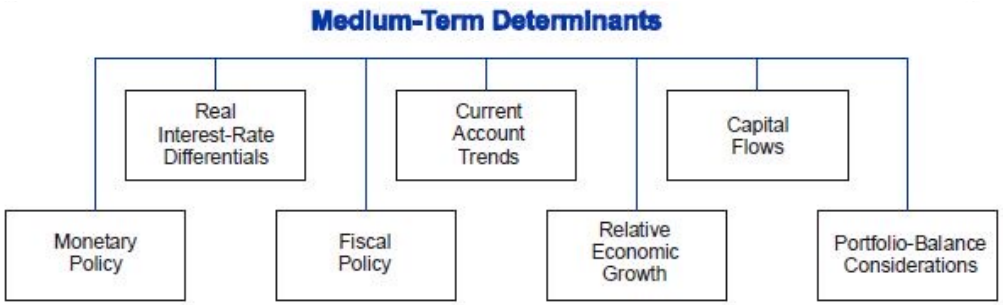


- Short-term behavior resembles a random walk

Exchange rate determination

Medium-term determinants

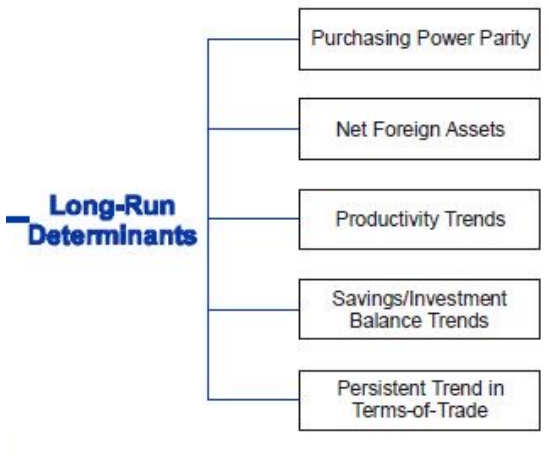
- Monetary policy
- Real interest-rate differentials
- Fiscal policy
- Current account trends
- Relative economic growth
- Capital flows
- Portfolio-balance considerations



Exchange rate determination

Long-run determinants

- Purchasing power parity
- Net foreign assets
- Productivity trends
- Savings/investment balance trends
- Persistent trend in terms-of-trade

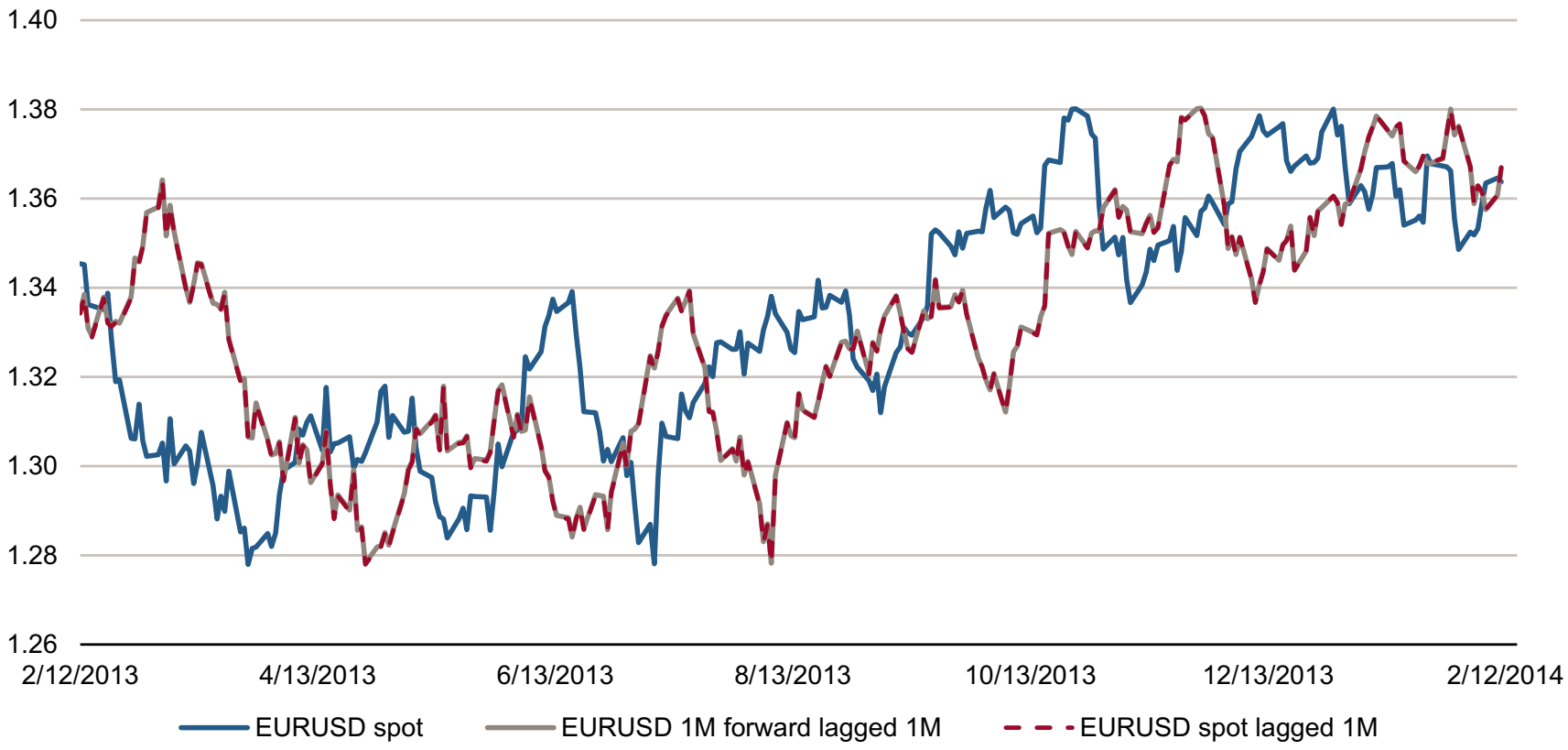


Uncovered interest rate parity ("Carry")

Uncovered interest rate parity ("Carry")

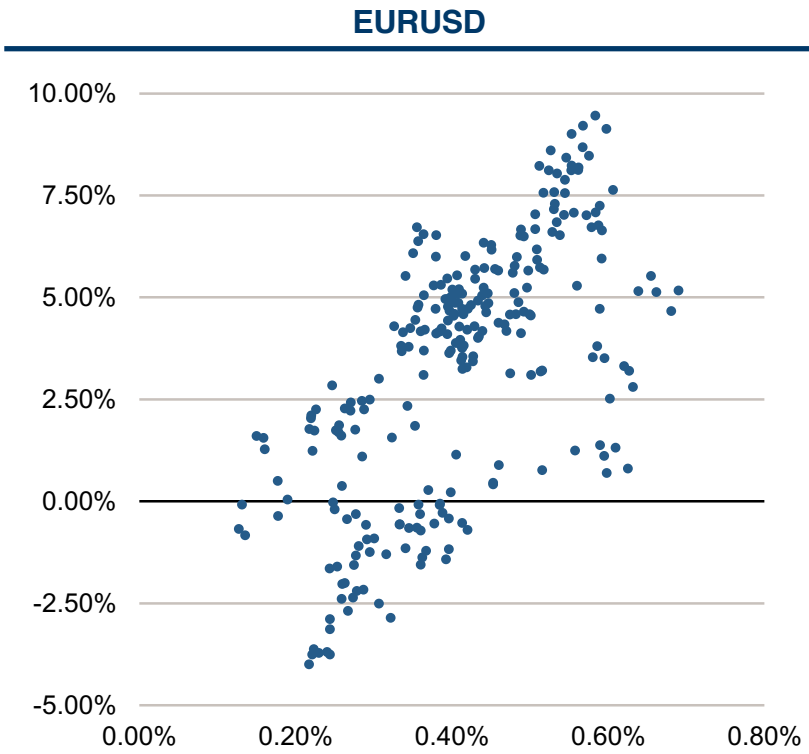
- Uncovered
  - Do interest rate differentials reflect market expectations of future spot exchange rates?
  - Are interest rate differentials a "good" (accurate? unbiased?) predictor of future spot rate returns?
- Carry = the difference between forward and spot rates
  - Reflects a "cost" or "incentive" to enter into a speculative forward trade
  - Spot must move beyond the carry (i.e., beyond the forward rate) for a speculator's positon to move from loss to gain (or from gain to loss)

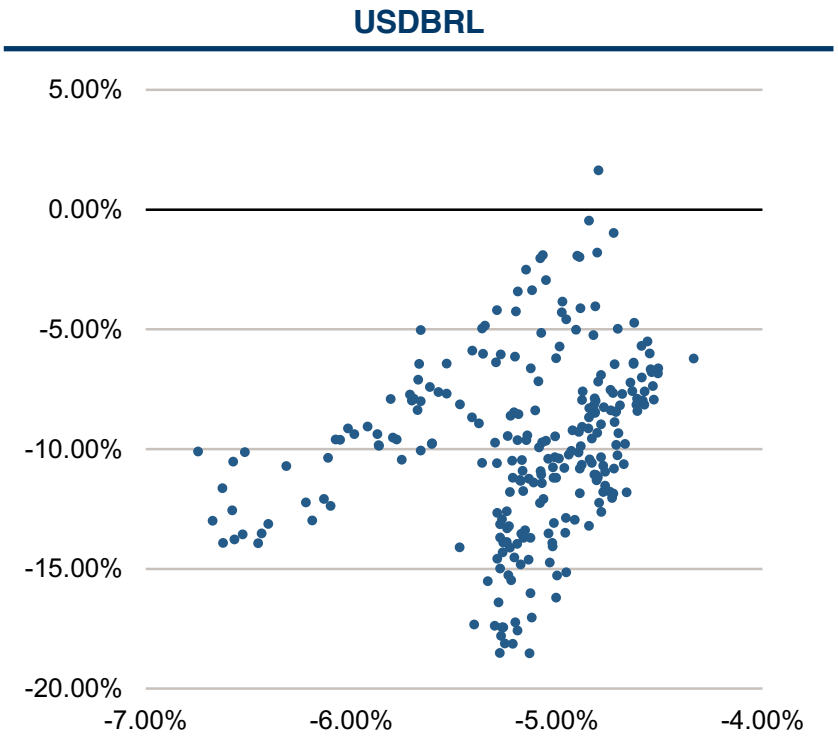
Example #1: Lagged EURUSD forward and spot rates versus realized spot rates over the past year



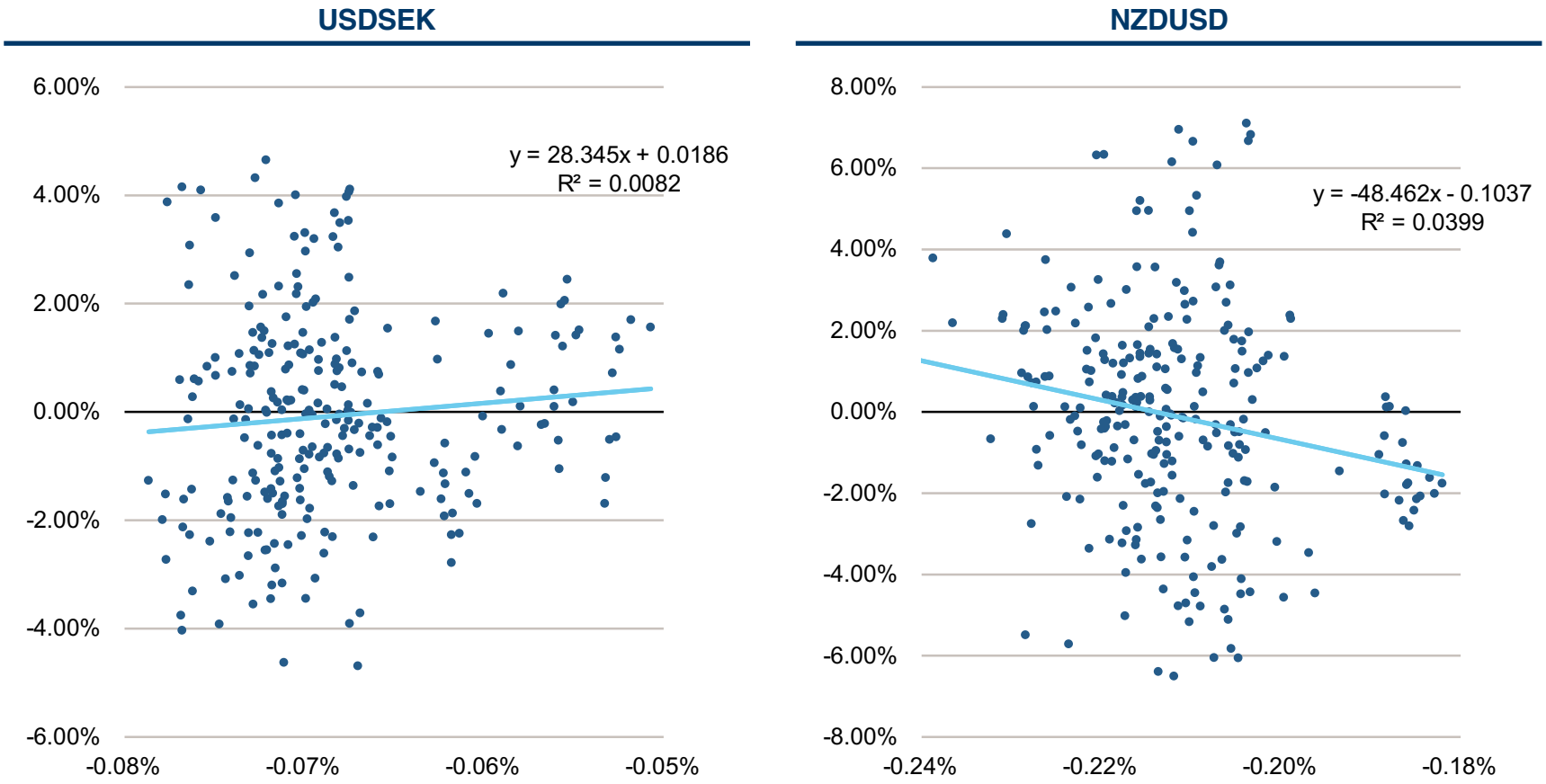
Example #2: Lagged USDBRL forward and spot rates versus realized spot rates over the past year

Example #3: Scatter plot of 1-year spot returns (independent variable) versus lagged 1-year forward differentials





Example: Scatter plot of 1-month spot returns (independent variable) versus lagged 1-month forward differentials



Carry Analyser

Risk Adjusted Carry | **Pivot ccy:** USD | ☑ Annualise Carry | **Sensitivity (sd):** -2 to 2 | **History:** 12M

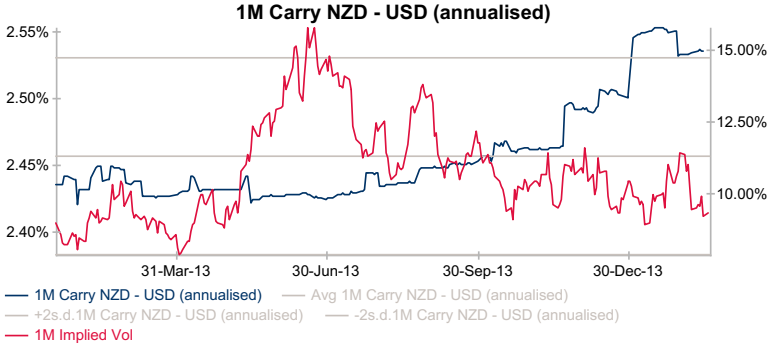
Carry, Implied and Historical Volatility Grid — **Risk Adj. Carry = Period Carry / 'Premium ATMF Opt'** — **Vol Adj. Carry = Period Carry / 'ATM**

	AUD-MMKT	CAD	CHF	DKK	EUR-MMKT	GBP	JPY	NOK	NZD	SEK	USD	CZK	HUF	PLN	ILS-FX	RUB-FX	TRY-FX	ZAR	CNY	CNH-FX	HKD	IDR-FX	INR	KRW	MYR	PHP-FX	SGD-FX	THB	BRL-CDI	CLP	COP	MXN
1M Carry	2.45	1.07	-0.16	-0.03	0.07	0.33	-0.01	1.51	2.54	0.71	---	0.13	2.70	2.46	0.52	5.90	9.72	5.42	5.21	0.81	0.05	3.60	8.91	2.40	2.99	0.54	-0.02	2.16	10.34	4.35	0.25	2.85
1M Adj Carry	2.41	1.37	-0.18	-0.04	0.10	0.37	-0.01	1.41	2.38	0.71	---	0.13	1.76	2.40	0.63	5.16	6.94	3.51	43.39	4.69	1.15	2.93	10.05	3.10	3.96	0.80	-0.05	2.80	7.50	3.67	0.26	2.49
3M Carry	2.39	1.03	-0.22	0.03	0.05	0.29	-0.02	1.47	2.69	0.72	---	0.13	2.61	2.47	0.49	6.60	10.32	5.44	5.36	0.86	0.14	5.15	9.55	2.41	3.05	0.45	-0.03	2.15	10.50	3.96	2.13	3.06
3M Adj Carry	1.31	0.77	-0.14	0.02	0.04	0.20	-0.01	0.78	1.39	0.40	---	0.08	0.98	1.26	0.37	3.25	4.17	1.95	24.50	2.89	1.70	2.20	4.62	1.60	2.07	0.35	-0.03	1.49	4.10	1.90	1.22	1.47
6M Carry	2.32	0.93	-0.25	0.15	0.06	0.29	-0.01	1.49	2.78	0.72	---	0.13	2.56	2.41	0.46	6.74	10.33	6.02	4.67	0.89	0.07	5.76	---	2.37	3.00	0.43	-0.06	2.14	10.62	3.79	2.51	3.15
6M Adj Carry	0.87	0.48	-0.11	0.07	0.03	0.14	-0.01	0.55	0.96	0.27	---	0.05	0.65	0.80	0.24	2.33	2.84	1.45	11.42	1.76	0.50	1.70	---	1.01	1.36	0.23	-0.04	1.01	2.84	1.27	0.99	1.01
1Y Carry	---	0.70	-0.35	0.17	-0.00	0.35	-0.22	1.01	---	0.71	---	-0.00	2.36	2.23	0.40	6.84	10.55	6.51	4.45	0.99	0.32	6.34	---	---	2.84	0.49	-0.08	---	10.75	3.55	2.69	3.10
1Y Adj Carry	---	0.25	-0.10	0.06	-0.00	0.12	-0.05	0.25	---	0.18	---	-0.00	0.40	0.47	0.15	1.59	1.94	1.04	5.34	0.96	1.11	1.25	---	---	0.83	0.17	-0.04	---	1.92	0.83	0.71	0.67

Carry Trades, Pivot USD

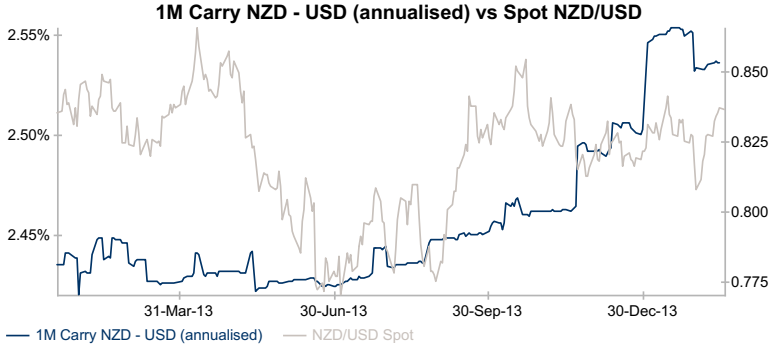
Cheap (-2) — Rich (2)

Historic Chart - Click on a Cell in the Grid



Source: Credit Suisse Locus

Spot vs Carry



Creating option strategies

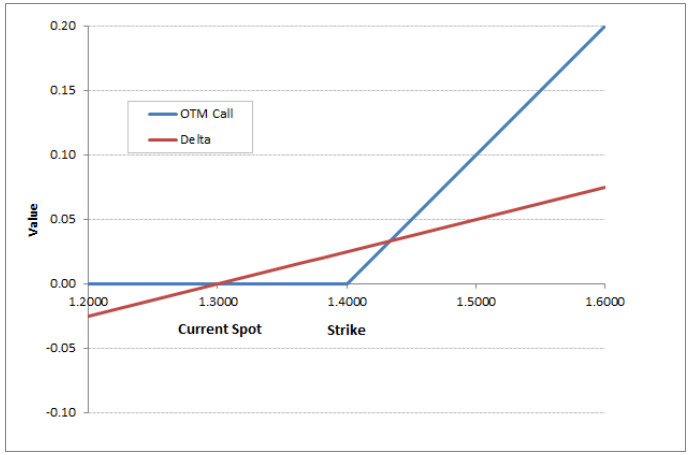
See Canvas

Files > Supplementary Material > FX Volatility and Option Structures

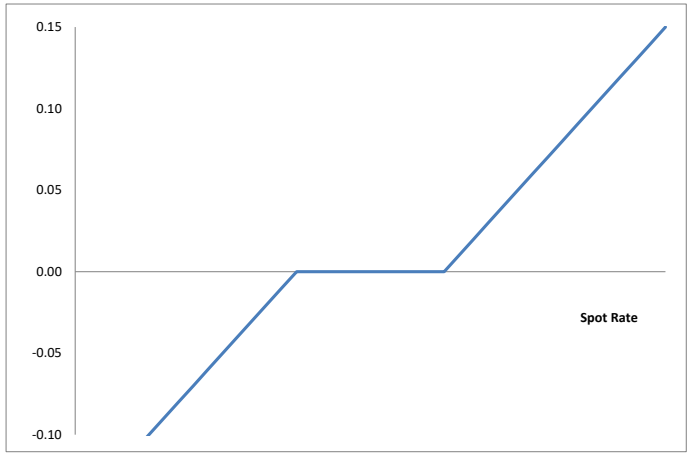
Creating option strategies

Directional strategies

- Low delta options
  - Hedger: “disaster insurance”
  - Speculator: “lottery ticket”



- Range forward (risk reversal, or collar)
  - Costless?
  - Cash flow at maturity is not the only relevant fact



- Call spreads and put spreads
  - The quanto effect in a call spread
  - (foreign currency terms)

Creating option strategies

"Positioning for Structural Bearish AUD View"

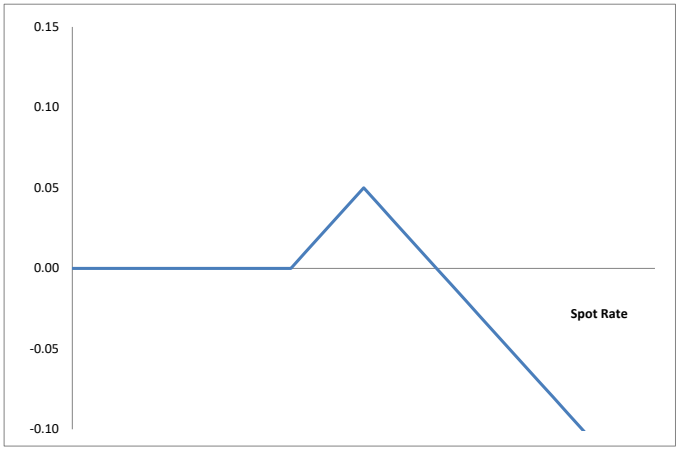
Credit Suisse FX Strategist, ***"Gravity weighs on the Aussie" 11 March 2013***

- We favour owning mid- to long-dated simple 1x1 AUDUSD put spreads to express our structural bearish view on the AUD. As an alternative expression, we also recommend a six-month digital put structure.
- Despite the year-to-date rise in implied G10 FX volatility, implied AUD volatility remains close to historically depressed levels, both on an outright basis and relative to rest of G10 FX vol matrix.
- As illustrated in Exhibit 14, AUD variance as a percentage of total G10 FX variance has fallen to the lowest level since early 2007. In part, the compression in implied AUDUSD volatility can be explained by the low level of realized volatility.
- AUDUSD spot has traded in a narrow 4.50% range since last July. As discussed above, we think that this range is unlikely to hold and expect AUDUSD to sell off below parity. We expect this to result in a repricing of AUD vols higher in line with the historical inverse AUD spot/vol correlation.
- With the recent spot sell-off, AUDUSD risk reversals have richened modestly relative to January levels and look elevated on a volatility-adjusted basis.
- To take advantage of downside AUD skews and the low level of implied volatility, we recommend the following structures:
  - **6-month AUDUSD 1x1 put spread:** Investors can buy six-month AUDUSD 0.98 puts versus selling the same notional of six-month AUDUSD 0.95 puts for 0.54% of the AUD notional (spot ref: 1.028), close to a 58% discount to the vanilla put. The maximum potential leverage on the trade is 5.8x, with maximum loss limited to the upfront premium.
  - **6m AUDUSD digital put:** A six-month AUDUSD 0.95 digital put is indicatively offered at 13.75% of the desired AUD payout (spot ref: 1.0280). If AUDUSD trades at or below the 0.95 barrier at expiry, the investor gets the AUD payout. The risk to the trade is limited to the upfront premium.

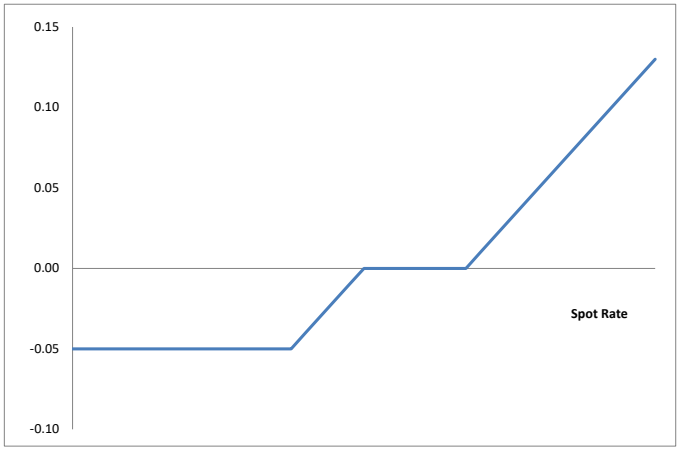
Creating option strategies

Directional strategies

- Ratio spreads



- Participating forwards
  - A blend of forward and option
- Combinations (e.g., seagulls)
  - Buy a call, finance it by selling a put spread



Creating option strategies

"Buy GBPSEK leveraged put spreads"

Credit Suisse FX Strategist, ***"Buy GBPSEK leveraged put spreads" 12 February 2013***

- **Three-month GBPSEK 1x2 RKI put spreads:** We recommend buying three-month GBPSEK 9.75 puts versus selling three-month 9.45 puts that only knock-in at 9.30 for 0.3950% of the GBP notional (spot ref: 9.9420, TV: 0.42%), around 60% discount to the vanilla put option. The maximum leverage on the trade is 12.2x premium if the 9.30 barrier does not get triggered during the life of the option. The loss on the trade is potentially unlimited the further GBPSEK trades below 9.45 at expiry, but only if the 9.30 barrier is triggered during the life of the option.
- **Three-month GBPSEK 1x2 put spreads:** Alternatively, investors can buy three-month 9.75/ 9.45 1x2 put spreads for 0.38% GBP (spot ref: 9.9420). The maximum leverage on the trade is 8.3x premium with risk of increasing losses the further GBPSEK trades below 9.45 at expiry.
- **EURGBP higher, EURSEK lower dual digital:** In the correlation space, investors can take advantage of the positive EURGBP/ EURSEK implied correlation to express a bullish EURGBP and bearish EURSEK view via dual digitals.
  - Three-month EURGBP higher, EURSEK lower dual digital
  - Strikes: EURGBP 2.25% OTMS
EURSEK 1.1250% OTMS
  - Offer: 10.00% EUR
  - Individuals: 31% and 33.50% indicatively
  - The risk to the trade is limited to the upfront premium.

Creating option strategies

Time strategies

- Calendar spreads – long and short options at different expiration dates
  - Express a view on the strength and timing of a directional move
  - Impacted by the implied volatility curve
  - .. and by the forward curve
- Diagonal spreads – long and short options at different expiration dates and strikes

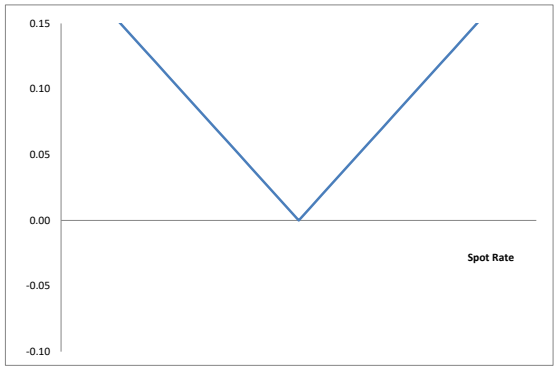
Buy 6m USDJPY call financed by selling one-month USDJPY Double One-Touch

- Buy 6m USDJPY 95.00 call in USD 100mm
- Sell 1m USDJPY 85.50 – 90.50 Double One Touch in USD 1mm pay-out (1% of the vanilla notional)
- Zero Cost (spot ref: 87.46)
- The maximum loss on the trade is limited to 1% of the vanilla notional. If USDJPY trades in the 85.50-90.50 over the next one-month, the client is just long the USDJPY 95.00 vanilla call option (for zero cost). If USDJPY breaks above the 90.50 barrier over the next month, the DOT would knock in and the client would have to pay 1% premium. However, the client would still be long the longer-dated call. This differentiates it from a Window RKO or DKO structure as the longer-dated option would still be alive.
- The structure takes advantage of the high level of front end USDJPY implied volatility and the flat vol term structure.

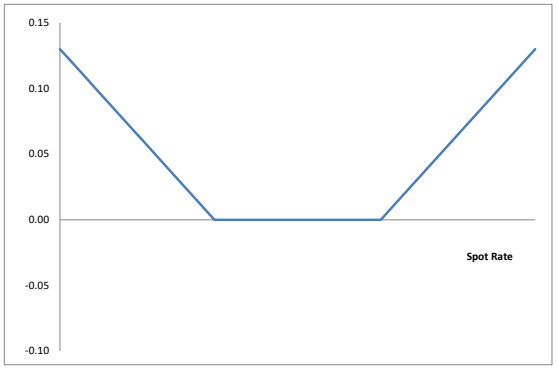
Creating option strategies

Non-directional strategies

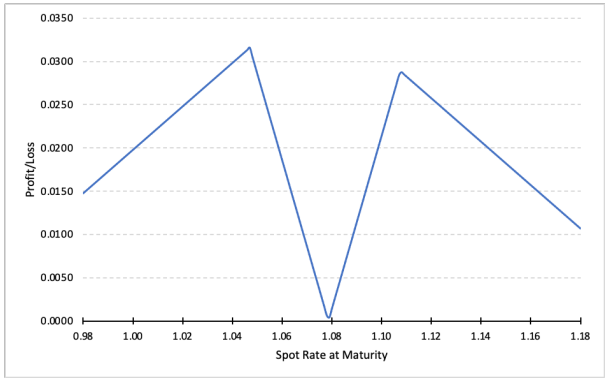
- Straddle



- Strangle



- Butterfly



Creating option strategies

"Buy two-month AUDNZD put butterfly"

Credit Suisse FX Strategist, ***"Buy two-month AUDNZD put butterfly" 31 January 2013***

- The RBNZ statement today is consistent with our view that stable RBNZ policy will allow the NZD to outperform the AUD as RBA eases policy further an iron ore prices retreat.
- We recently turned bearish AUDNZD and expect the cross to trend lower to 1.22 in three months and 1.19 in twelve months (see *FX Compass –The End of Australian Exceptionalism*).
- We recommend buying a two-month AUDNZD 1x2x1 RKI put butterfly to position for continued NZD outperformance versus the AUD.
  - Specifically, we suggest buying a two-month 1.2350 put and 1.1950 puts versus selling twice the notional of two-month AUDNZD 1.2150 puts that only knock in at 1.1950.
  - The structure is indicatively offered at 0.3650% AUD (spot ref: 1.2442), close to a 52% discount to the 1.2350 vanilla put.
  - The maximum potential leverage on the trade is 9.1x the premium if the 1.1950 barrier on the sold put does not get knocked in during the life of the option. The potential loss on the trade is limited to the upfront premium. The two-month expiry encompasses the April RBA meeting.
- As an alternative vanilla expression, investors can buy simple 2-month AUDNZD 1x2x1 put spreads – buying two-month 1.2350 and 1.1950 puts versus selling twice the notional of 1.2150 puts for a net cost of 0.30% AUD (spot ref: 1.2442).
  - The maximum leverage on the trade is 5.4x the premium with potential losses limited to the upfront cost.

Creating option strategies

"Focus on JPY vols"

Credit Suisse FX Vol Strategist, ***"Focus on JPY vols" 13 February 2012***

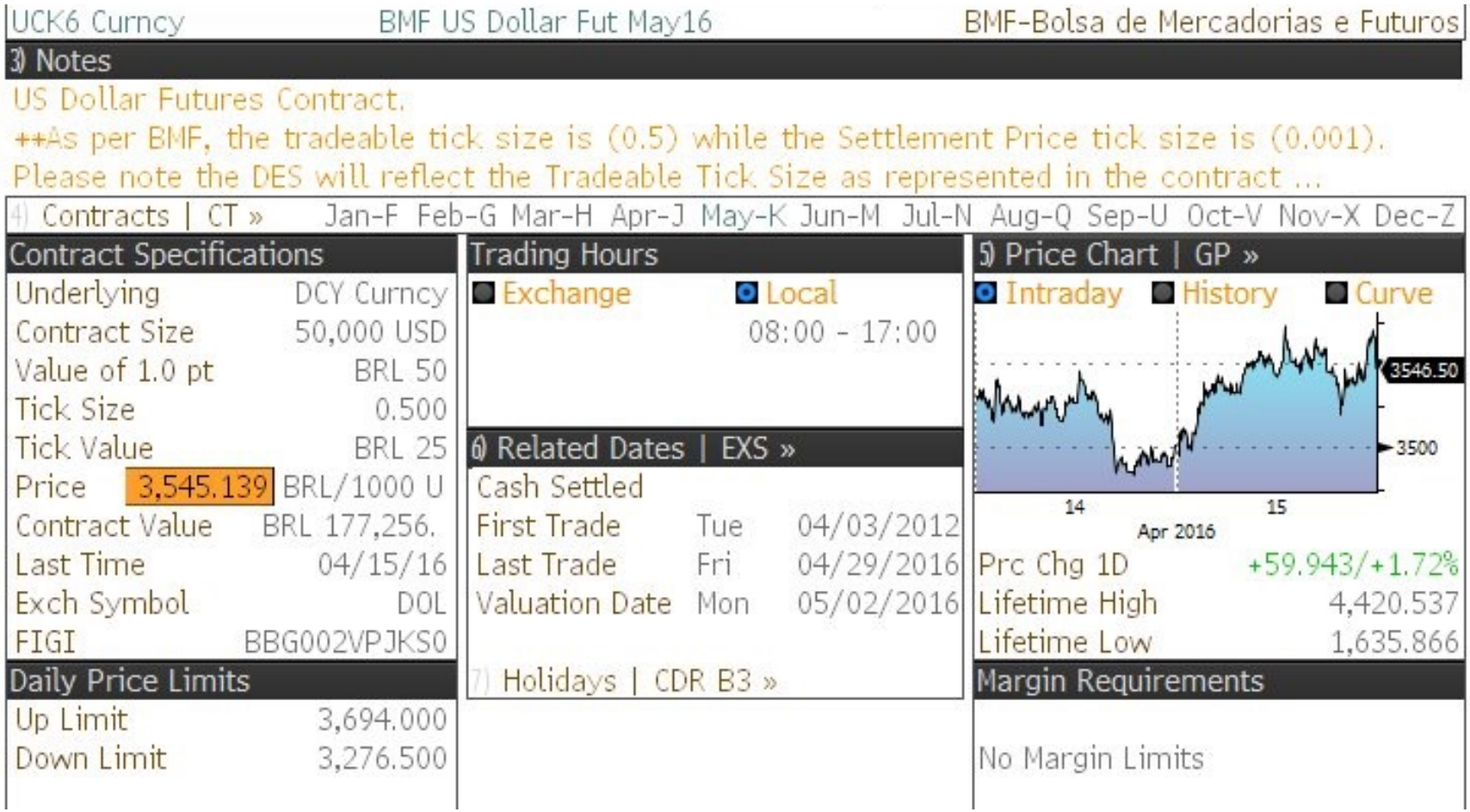
- Front-end implied volatility across the FX universe is close to post-Lehman lows. Meanwhile, long-end vols across most of the G10 spectrum remain elevated relative to the front end, keeping the term structure of volatility steep.
- Gamma pricing for most of the USD majors looks fair based on our models with very little premium for potential euro stress. We think this decrease in risk premium represents a combination of improved liquidity conditions and better growth prospects away from the epicenter of stress in the euro area. Additionally, policy response and flexibility have also eased tail risk concerns. Nevertheless, we think that the sharp fall in implied vols since the start of the year have generally reduced risk/reward of running outright short vol positions in the majors.
- We also look at the unprecedented cheapening in JPY skews and highlight two relative value opportunities. USDJPY risk reversals are now skewed to the topside all the way out to the six-month point on the curve with the 1yr USDJPY risk reversal currently at its cheapest level since December 2002. We recommend a six-month USDJPY leveraged call spread and buying 1yr AUDUSD puts versus selling 1yr AUDJPY puts.
- Elsewhere, we like exploiting the rich wing pricing in CHF crosses. CHF cross vols continue to trade higher compared to EUR cross vols and with richer wing pricing. Given our expectation for the EURCHF floor to hold, we think the CHF is a better alternative to express a bearish euro view versus the USD as well as other G10 currencies via seagulls or outright CHF put spreads.

Futures

Futures

- Forward contract
  - Over-the-counter
  - No preset terms
  - No interim cash flows
  - Credit exposure to a single counterparty
- Futures contract
  - Traded on an exchange
  - Standardized terms
  - Daily mark-to-market
  - Credit exposure to an exchange/clearing entity

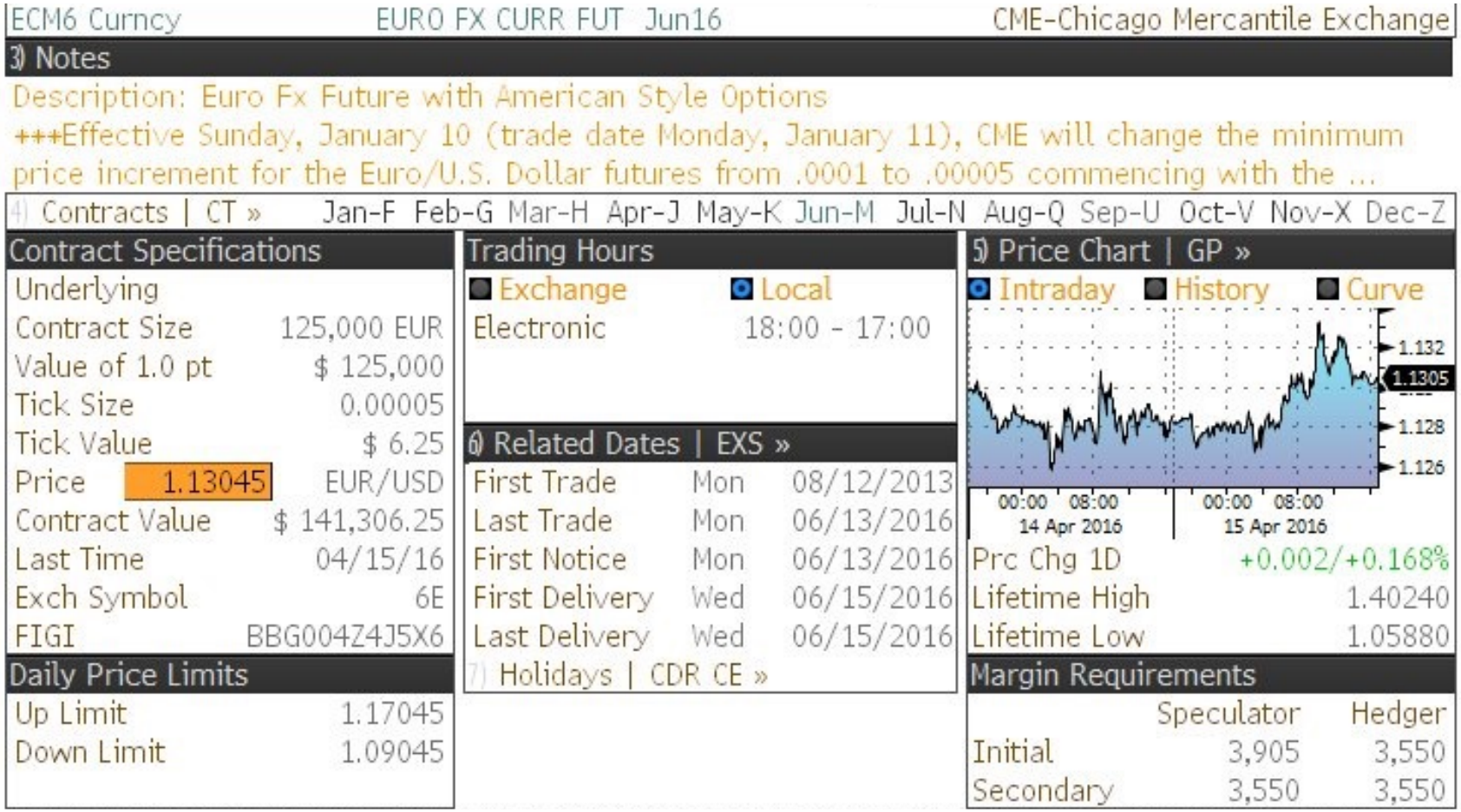
Example: Brazilian futures contract on the US dollar



Brazilian futures volume and open interest

Description	Last	Chg Settle	Time	Bid	Ask	Open Int	Volume	Yest Settle
Spot	3483350.04 s	-14799.83	Close	3482200.15	3484499.93			3498149.87
May16	3485.196 s	-20.476	Close	3498.000	3501.500	833868	487485	3505.672
Jun16	3517.839 s	-20.862	Close	3590.000	3539.000	47332	7420	3538.701
Jul16	3553.482 s	-20.731	Close	3570.000	3595.000	68860	395	3574.213
Aug16	3584.331 s	-20.877	Close			1855		3605.208
Sep16	3618.651 s	-21.604	Close			11300		3640.255
Oct16	3650.826 s	-21.693	Close			22091		3672.519
Nov16	3680.218 s	-21.887	Close			10840		3702.105
Dec16	3706.285 s	-21.430	Close			10130		3727.715
Jan17	3735.741 s	-21.185	Close	3785.000	3785.000	42125	5850	3756.926
Feb17	3765.044 s	-22.637	Close			120		3787.681
Mar17	3790.416 s	-19.934	Close			100		3810.350
Apr17	3820.463 s	-24.526	Close			143		3844.989

Example: US futures contract on the EUR



EURUSD futures volume and open interest

Description	Last	Chg Settle	Time	Bid	Ask	Open Int	Volume	Yest Settle
21) Jun16	1.12855s	-.00180	Close	1.12830	1.12905	333150	150653	1.13035
22) Sep16	1.13225s	-.00185	Close	1.12950	1.13660	3020	155	1.13410
23) Dec16	1.13610s	-.00195	Close	1.13100	1.17500	1167	127	1.13805
24) Mar17	1.14005s	-.00195	Close	.90000	1.16000	286		1.14200
25) Jun17	1.14500s	-.00195	Close	1.14000	1.17000	43		1.14695
26) Sep17	1.14975s	-.00200	Close			1		1.15175
27) Dec17	1.15450s	-.00205	Close					1.15655
28) Mar18	1.15925s	-.00210	Close					1.16135
29) Jun18	1.16465s	-.00210	Close					1.16675
30) Sep18	1.17030s	-.00215	Close					1.17245
31) Dec18	1.17595s	-.00220	Close					1.17815
32) Mar19	1.18160s	-.00230	Close					1.18390
33) Jun19	1.18725s	-.00235	Close					1.18960

Global currency futures – most active contracts

Category: Currency, Filters: Has volume, Has open interest

	Ticker	Description	Exchange	Type	Options	Volume↑	Open Int
				Future	All	> 100	> 100
1)	URA Curncy	USD/RUB	Moscow Exchange	Future	Yes	2801754	2430364
2)	UCA Curncy	USD (US Dollar) Future	Bolsa De Mercadorias	Future	No	302640	1345940
3)	RUPA Curncy	USD/INR	MCX Stock	Future	Yes	219663	335535
4)	DUSA Curncy	A3500 US Dollar (AON)	Rosario Futures Excha	Future	No	154240	2432768
5)	WDOA Curncy	Mini Dollar Futures	Bolsa De Mercadorias	Future	No	116817	15613
6)	KUA Curncy	USD (US Dollar)	Korea Exchange	Future	No	106130	567358
7)	ECA Curncy	EUR/USD Future	Chicago Mercantile Exc	Future	Yes	103062	450728
8)	WTA Curncy	EUR/USD AON Euro Style	Chicago Mercantile Exc	Future	No	103062	450728
9)	YTA Curncy	EUR/USD Euro Style	Chicago Mercantile Exc	Future	Yes	103062	450728
10)	UGA Curncy	EUR/USD AON American Style	Chicago Mercantile Exc	Future	Yes	102997	450728
11)	A1A Curncy	TRY (Turkish Lira)	Borsa Istanbul	Future	No	80946	263482
12)	JYA Curncy	JPY/USD Future	Chicago Mercantile Exc	Future	Yes	44728	181428
13)	WJA Curncy	JPY AON, European	Chicago Mercantile Exc	Future	Yes	44728	181428
14)	YJA Curncy	JPY/USD Euro Option	Chicago Mercantile Exc	Future	Yes	44728	181428
15)	DRAA Curncy	Dollar/Rand Future	JSE Interest Rate Mark	Future	Yes	40571	1334480
16)	ADA Curncy	AUD/USD Future	Chicago Mercantile Exc	Future	Yes	38551	160151
17)	DRRA Curncy	A3500 US Dollar	Rosario Futures Excha	Future	Yes	22926	2432768
18)	B1A Curncy	GBP(British Pound) European Sty	Chicago Mercantile Exc	Future	Yes	22000	184671
19)	BPA Curncy	GBP/USD Future	Chicago Mercantile Exc	Future	Yes	22000	184646

Forward Contract: No Interim Cash Flows

- Forward contract
  - The only scheduled cash flows are at maturity (on the value date)
  - Non-financial clients – generally no margining
  - Financial clients – margining ("collateral accounts")
    - No change of ownership in a collateral account
    - (unless a default event)

Futures Contract – Interest Rate Convexity

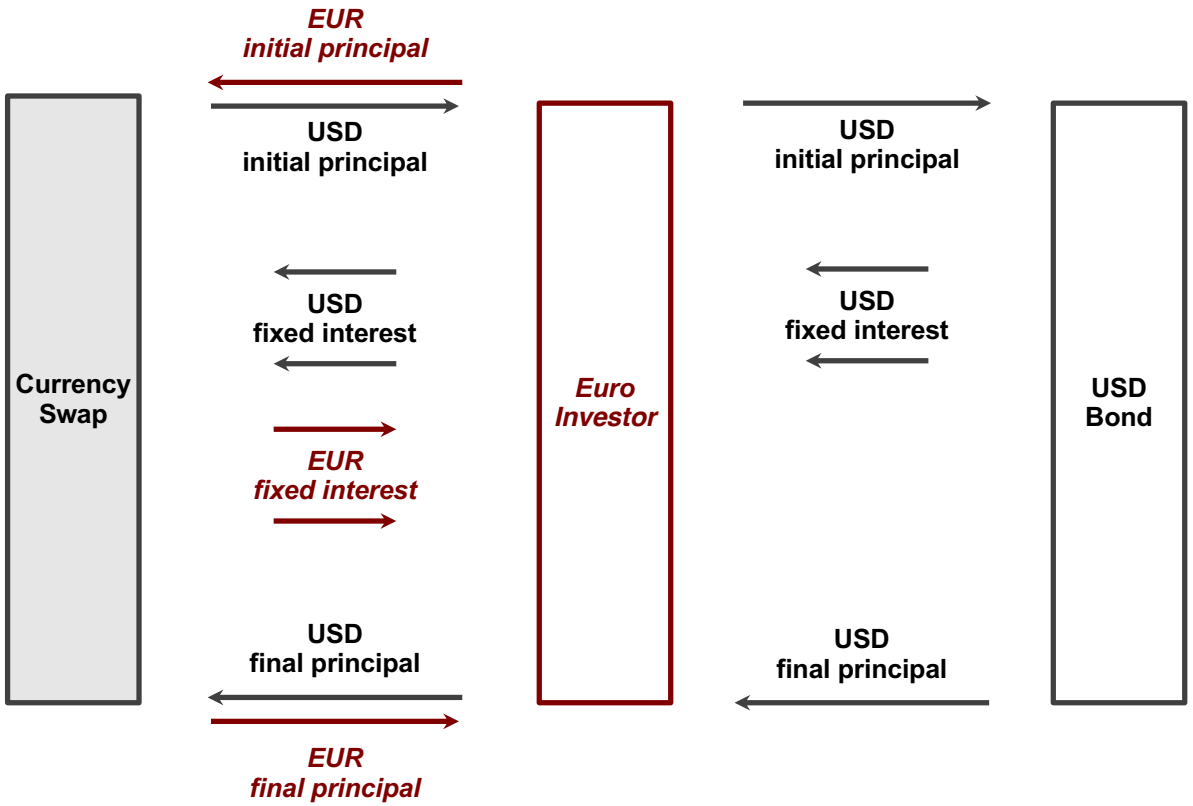
- Futures contract
  - Daily mark-to-market which causes daily cash flows (change of ownership)
- What if the underlying is correlated to daily interest rates for borrowing and investing?
  - Economic benefit to being “long rates”
  - Evident in Eurodollar futures, not significant for currency futures

Currency swaps

See Canvas

Files > Supplementary Material > Currency Basis Swaps

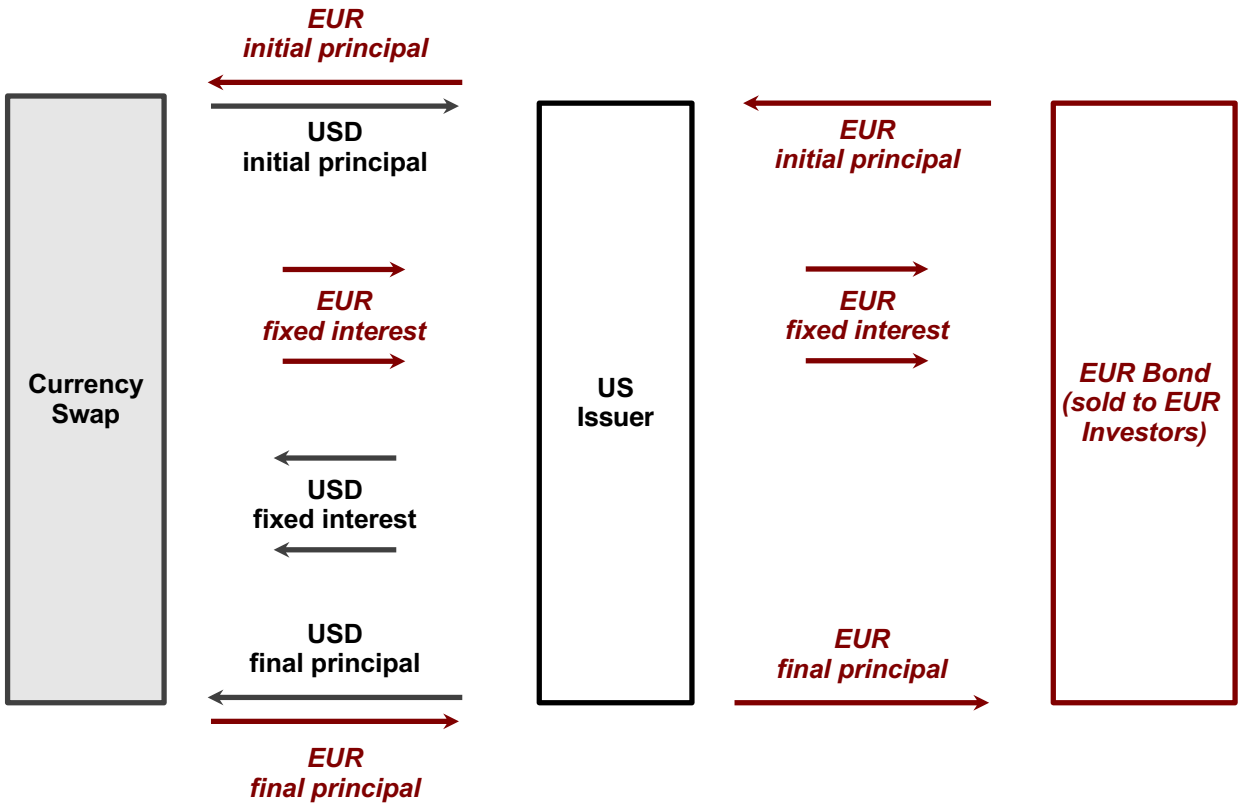
Cash flows of a Currency Swap



Example above: a EUR investor using a currency swap to exchange cash flows of a fixed rate USD bond for those of a fixed rate EUR bond

Sometimes called “cross-currency swap” to avoid confusion with “FX swaps”

Cash flows from an issuer's perspective

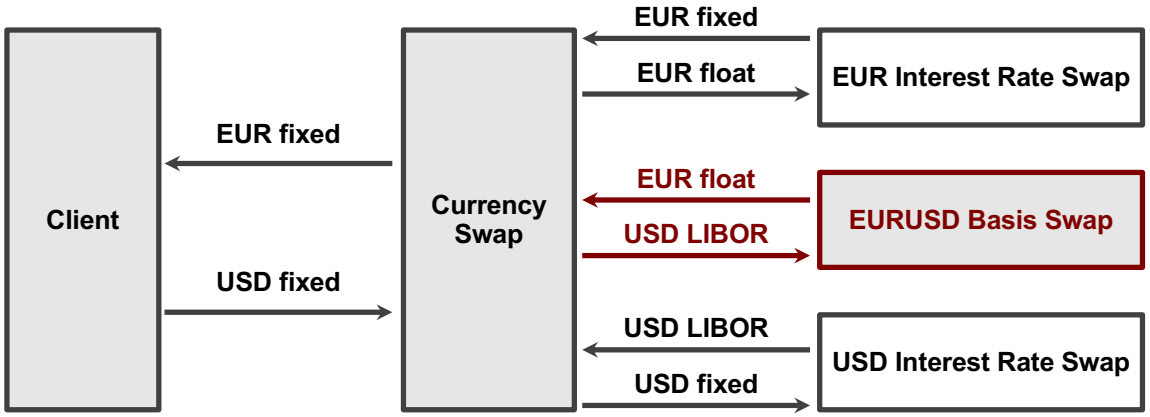


Example above: a USD issuer using a currency swap to exchange cash flows of a fixed rate EUR bond for those of a fixed rate USD bond

Issuers can compare the funding cost for a USD bond issuance to the cost of a swapped EUR bond issuance

Mechanics: the currency basis swap

Breaking down a currency swap into components



Currency basis swap market

Tenor	Bid	Ask	Time
1) 3 Month	-25.50	-19.50	04/15
2) 6 Month	-27.25	-21.25	04/15
3) 9 Month	-30.00	-24.00	04/15
4) 1 Year	-30.00	-26.00	04/15
5) 2 Year	-33.75	-29.75	04/15
6) 3 Year	-37.63	-33.63	04/15
7) 4 Year	-40.50	-36.50	04/15
8) 5 Year	-42.88	-38.88	04/15
9) 6 Year	-43.88	-39.88	04/15
10) 7 Year	-44.25	-40.25	04/15
11) 8 Year	-43.75	-39.75	04/15
12) 9 Year	-43.13	-39.13	04/15
13) 10 Year	-42.50	-38.50	04/15
14) 11 Year	-41.50	-37.50	04/15
15) 12 Year	-40.50	-36.50	04/15

Tenor	Bid	Ask	Time
16) 13 Year	-39.13	-35.13	04/15
17) 14 Year	-37.88	-33.88	04/15
18) 15 Year	-36.63	-32.63	04/15
19) 20 Year	-31.75	-27.75	04/15
20) 25 Year	-28.63	-24.63	04/15
21) 30 Year	-28.000	-24.000	04/15
22) 40 Year	-32.500	-28.500	04/15
23) 50 Year	-35.625	-31.625	04/15

Currency basis swaps are quoted as:

USD-LIBOR “flat” (meaning no spread), the spread applies to the non-USD leg

So, for the EUR basis swaps quoted above, 10-year bid quote of “-42.50”, means a market maker would: pay EURIBOR - 0.4250% and receive USD-LIBOR (flat)

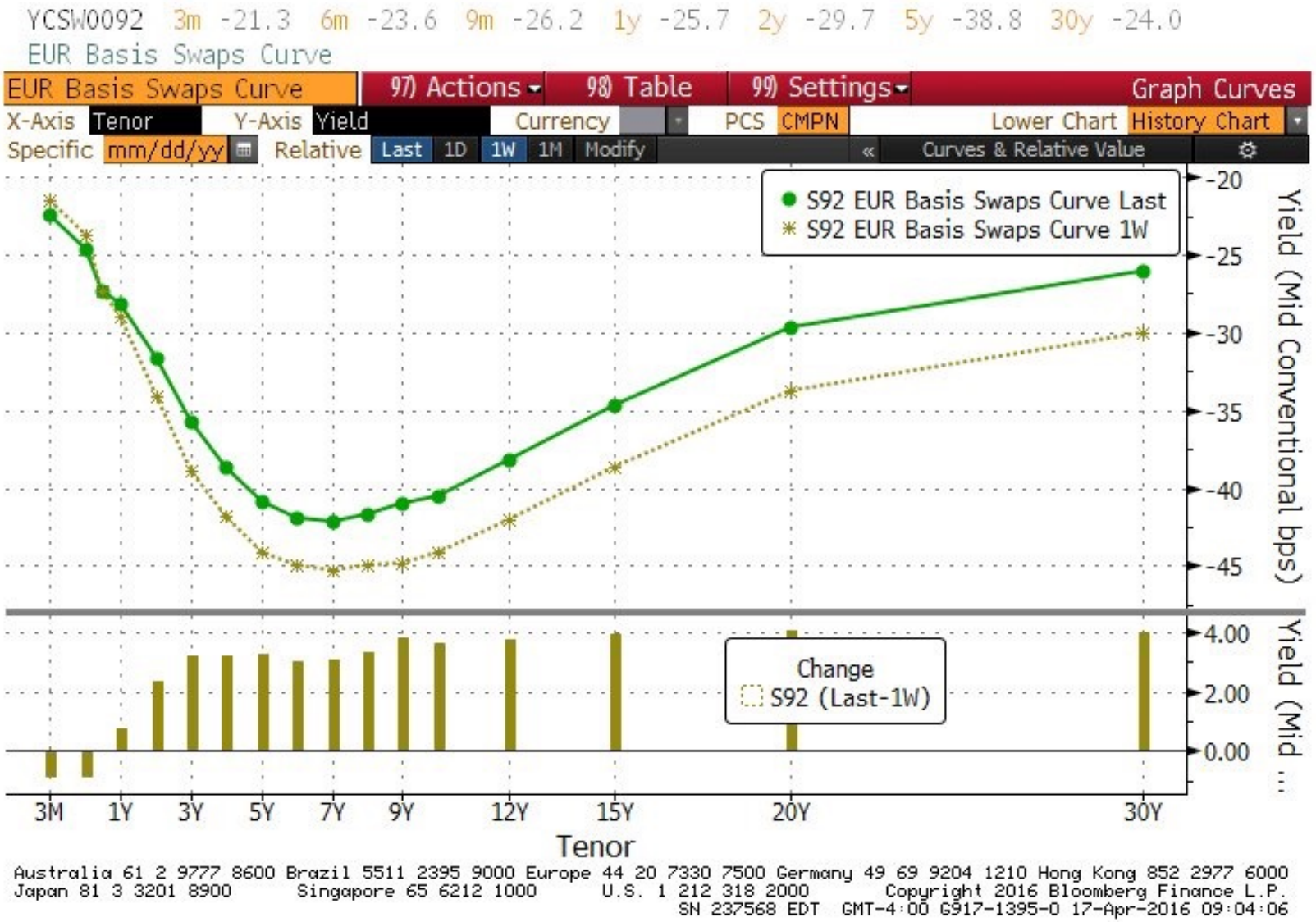
Currency basis swap market

Curve Properties			
Entity	European Union	Type	IRS
Currency	EUR	Subtype	Spread , Basis
Curve ID	S92 Corp	Calc Convention	Act/360
Bloomberg ID	YCSW0092 Index	Pricing Frequency	Intraday
FIGI	BBG006Z3S8F7	Pricing Source	Contributed/PCS
Rulemaker	Bloomberg	Member Update Freq	Bloomberg

Curve Details

This curve represents Euro-denominated swaps in which participants exchange interest-rate payments that are both based on a floating-rate short-term index. The day count for the EUR side of the swap is Actual/360 paying quarterly based on the Euribor three-month rate {EUR003M<INDEX><GO>}. The day count for the USD side of the swap is Actual/360 paying quarterly based on the BBA LIBOR USD three-month rate {US0003M<INDEX><GO>}. Pricing is a best bid/ask composite from latest quotes and the sources include both banks and brokers.

Currency basis swap market



EUR 5-year cross-currency basis swap history since 1999

- The EUR basis market reacted dramatically to the 2007 US leverage crisis and 2008 Lehman bankruptcy
- The European debt crisis has continued to destabilized this market

JPY 5-year cross-currency basis swap history

- This is not unique to EUR. Compare to the JPY basis swap market in 1998

Cross-currency basis swaps for AUD, EUR, and JPY

- Credit quality of the LIBOR pool
- Interbank demand for USD by Yankee banks to finance US subsidiaries