How Much Discretion is Needed In the Hedging Process

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OVERVIEW

- The market seems to be facing substantial uncertainty

- But market pricing seems to imply a benign environment

- Why is market volatility generally so low and
  - Why is FX vol diverging in a positive direction?

  - **What are things to consider when structuring hedges**
    - And ways that structured options may reduce costs

THE WORLD HAS BEEN A VOLATILE PLACE

- **Over the past few years there were several large swings in markets**
  - The EURCHF plunge at the beginning of last year
  - The JPY lost 20% in 2015 and gained it back this year
  - The GBP plunge in the wake of BREXIT
  - And the EUR also plunged against the USD on BREXIT

AND RISKS ARE NOT GOING AWAY

- The UK continues to move forward on BREXIT
- Greek debt remains dangerously high
- The SNB continues to intervene in CHF
- The uncharted waters of negative interest rates
- Chinese growth continues to slow
- An unprecedented US election ahead
- And when will the Fed hike rates?

BUT MARKETS ARE UNUSUALLY CALM

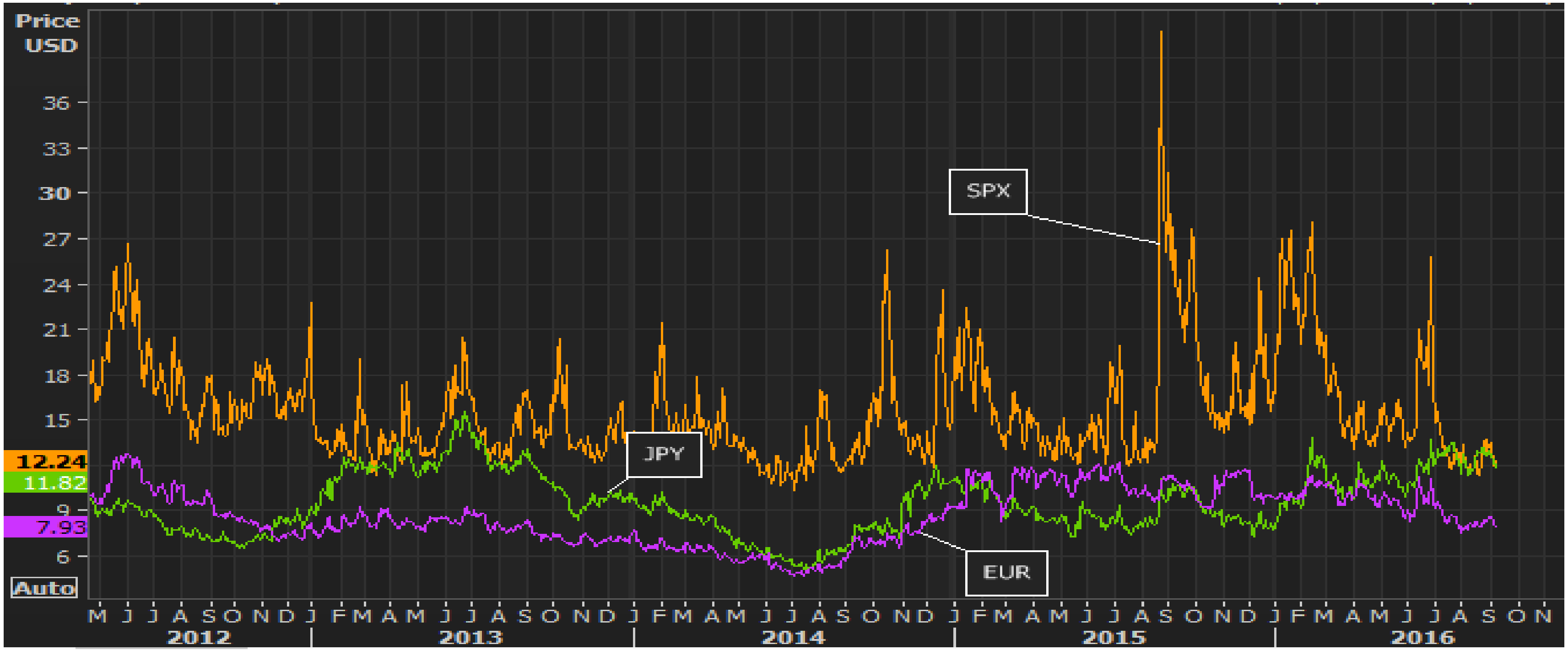
1-Month Realized Volatility

Source: Thomson Reuter Eikon

- Realized SPX volatility is near all-time lows – US bond volatility also low
- FX volatility is roughly in line with historic average
- This is the past, what about expectations?

AND PRICED FOR THE CALM TO LAST

3-Month Implied Volatility



Source: Thomson Reuter Eikon

- SPX implied Vol (VIX) is approaching historic lows – through the election
- In line with realized vol, FX implied vol is well within historic ranges
- Why is equity outlook so benign? Why the divergence for FX?

CENTRAL BANK EXTREME EASING BEARISH FOR VOLATILITY

- Low yields are bearish for bond volatility because there is still resistance to dipping into negative territory so bond rates are squeezed into a narrow range as they approach or go below zero.

- Volatility is covariant across markets so anything that depresses volatility in bonds tends to weigh on volatility in equity and currency markets.

- Equity volatility is directional, rising in bear markets and falling in bull markets. Low bond yields also depress equity volatility as they imply an extension of central bank accommodation.

- The convergence of short-term rates at close to zero depresses volatility in all markets – especially currencies.

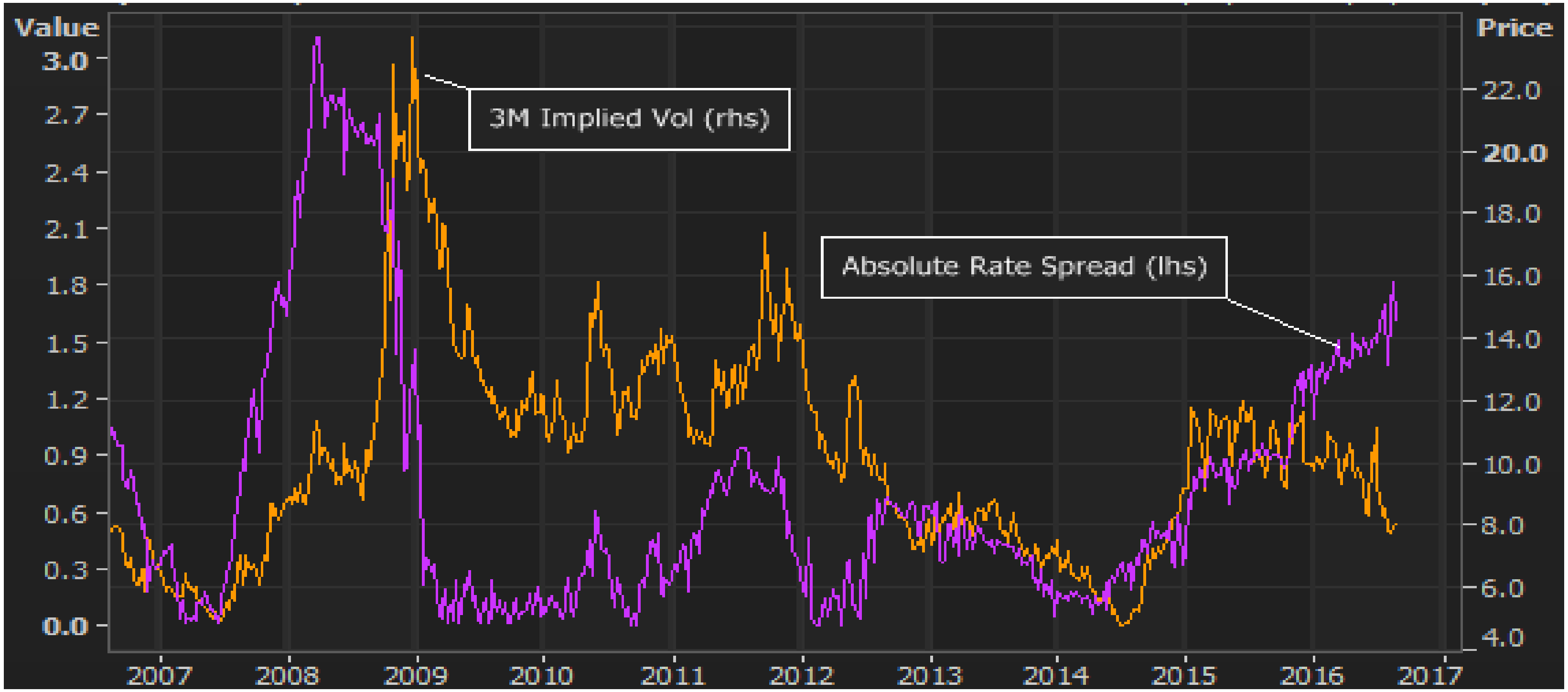
LOW RATES ARE CRUSHING EQUITY VOLATILITY

10Y UST Rate and Realized SPX 1M Volatility

Source: Thomson Reuter Eikon

FX VOLATILITY PULLED BOTH UP AND DOWN

3-Month EUR Implied Volatility and 3M EUR vs USD rate spread



Source: Thomson Reuter Eikon

- As rate spreads widen there is more incentive for capital to cross borders
- EUR implied vol tends to track the absolute spread in rates
- But also being held down by low volatility in other markets.

SOME HEDGING ISSUES TO ADDRESS

- We will assume no discretion in decision to hedge
  - But that still may leave room for maturity and structure of hedge
  - We will base this on measurements of cheap and dear pricing
  - But this does leave several interesting issues we will not address – e.g.…
- Defining exposure
  - Accounting convention can affect exposure
    - And management of dynamic changes in exposure
  - Do you itemize or aggregate exposure
    - If latter do you take a portfolio approach
- Incorporating global views and forecasts
  - How best to reflect market views via hedges

SO IS FX VOLATILITY ACTUALLY CHEAP?

Currency	3M Implied Vol Value	3M Implied Vol Percentile	3M Implied Vol / Realized Vol Value	3M Implied Vol / Realized Vol Percentile	1Y/3M Implied Vol Curve Percentile	5Y/1Y Implied Vol Curve Percentile
EURCHF	4.95	44.01	0.87	8.93	82.40	71.65
EURSEK	6.08	16.71	1.06	49.74	85.97	52.04
EURCAD	8.03	33.80	1.16	77.30	90.18	88.39
EURNOK	8.06	36.14	1.04	63.14	88.90	55.56
EURUSD	8.07	41.07	0.95	28.95	58.80	65.69
EURGBP	8.53	48.28	0.52	0.26	50.89	49.62
EURAUD	9.13	28.55	1.25	95.52	89.03	54.72
EURNZD	10.09	33.42	1.14	78.23	85.84	38.01
EURJPY	11.35	76.41	0.61	0.89	30.99	7.27

Blue is bottom 25th percentile and red is top 25th percentile

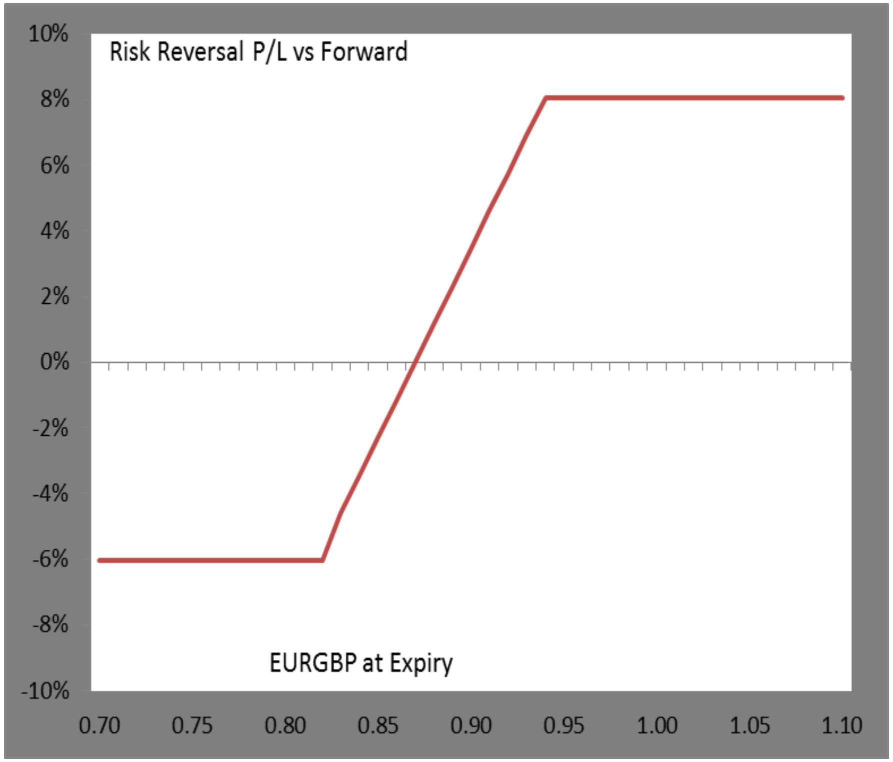
Source: Thomson Reuter Eikon

- Most vols are historically mid-range on an outright basis
- But tend to be expensive relative to where vols are realizing
- The exceptions are EURGBP and, especially, EURJPY
  - Options are potentially an attractive alternative for hedging

DOES SKEW PROVIDE ANY INFORMATION?

Currency	3M Risk Reversal skew	3M Risk Reversal skew / Implied Vol (%) Value	3M Risk Reversal skew / Implied Vol (%) Percentile
EURCHF	-1.71	-30.44	13.52
EURSEK	0.61	9.85	42.98
EURUSD	-0.80	-9.89	82.65
EURCAD	0.47	5.65	71.01
EURNOK	1.13	13.39	67.47
EURGBP	0.45	4.79	77.93
EURAUD	0.88	8.91	39.92
EURNZD	0.72	6.59	24.49
EURJPY	-2.02	-17.16	32.27

Blue is bottom 25th percentile and red is top 25th percentile



Source: Thomson Reuter Eikon

- Not surprisingly EURCHF is skewed for EUR puts
- Only other interesting skew is for EURGBP calls – RR offers good tradeoff
- JPY put skew is large outright so option buyers should consider low delta strike

SCANNING FOR MATURITY BIAS

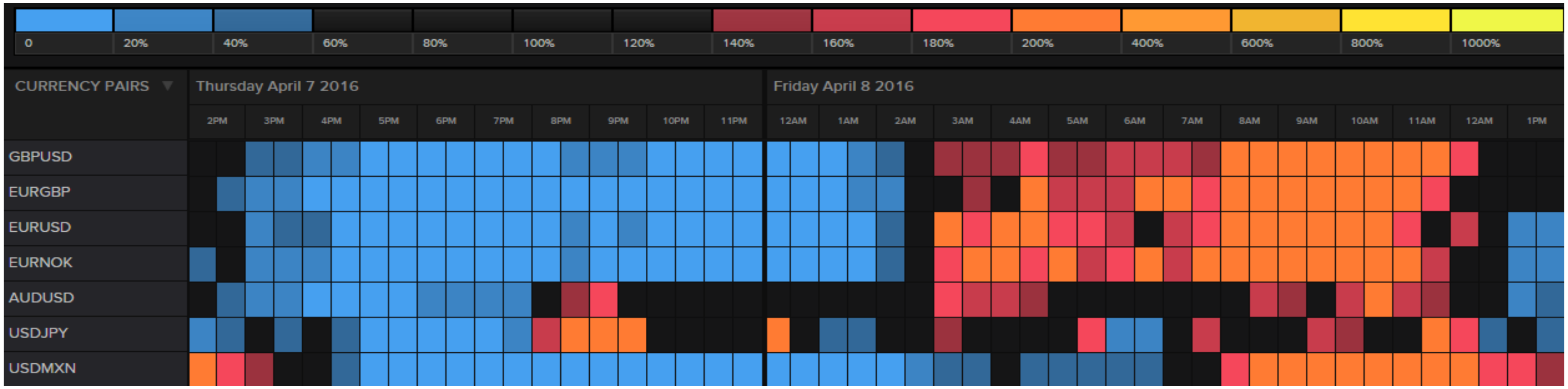
Currency	1Y Annualized Net Carry Net Change	1Y Annualized Net Carry Value	1Y Annualized Net Carry Percentile	1Y Net Carry / Implied Vol Value	1Y Net Carry / Implied Vol Percentile
EURCAD	-0.04	1.45	95.28	0.16	91.07
EURNOK	-0.02	1.45	80.36	0.17	60.59
EURGBP	0.00	0.88	55.87	0.10	54.72
EURJPY	-0.01	-0.09	53.95	-0.01	55.36
EURCHF	-0.01	-0.52	50.00	-0.08	52.81
EURSEK	0.03	-0.12	32.65	-0.02	27.42
EURAUD	0.02	2.53	19.26	0.25	50.77
EURNZD	-0.02	2.95	8.55	0.27	32.53
EURUSD	0.04	-1.69	2.55	-0.20	0.77

Source: Thomson Reuter Eikon

- Extreme levels of carry can help determine a bias on maturity
- EUR buyers should be short maturity for CAD and JPY exposure and..
- ..long maturity for exposure in USD and maybe SEK

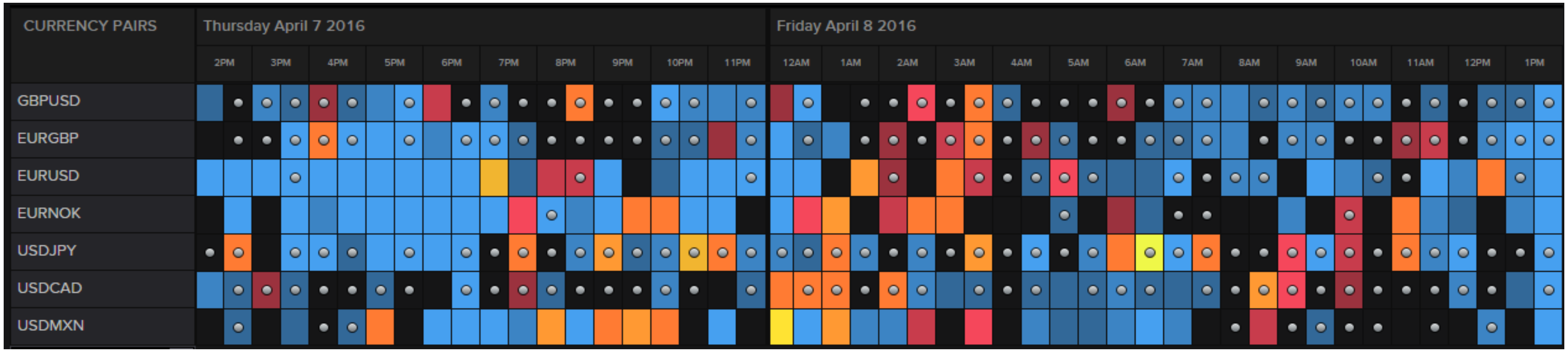
TAILORING EXECUTION TO LIQUIDITY CONDITIONS

Heat Map of Average Liquidity Over Course of the Day



Source: Thomson Reuter Eikon

Heat Map of Today's Relative Liquidity

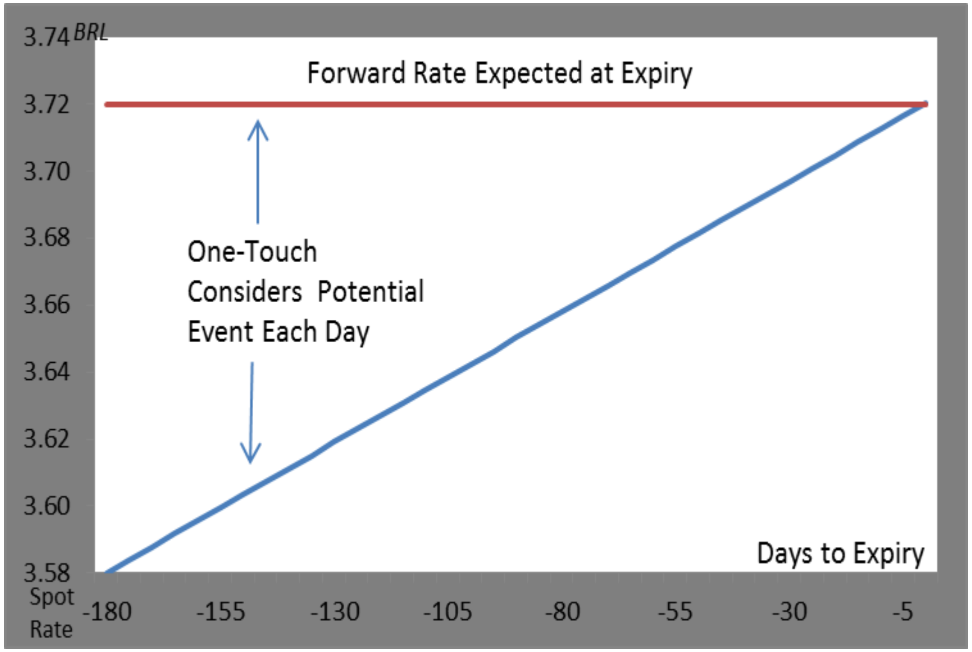


Source: Thomson Reuter Eikon

- Liquidity dries up in the US afternoon – except for MXN
- Monday was a low volume day for most currencies

COMPENSATING FOR HIGH BRL CARRY

Forward vs One-Touch Probability



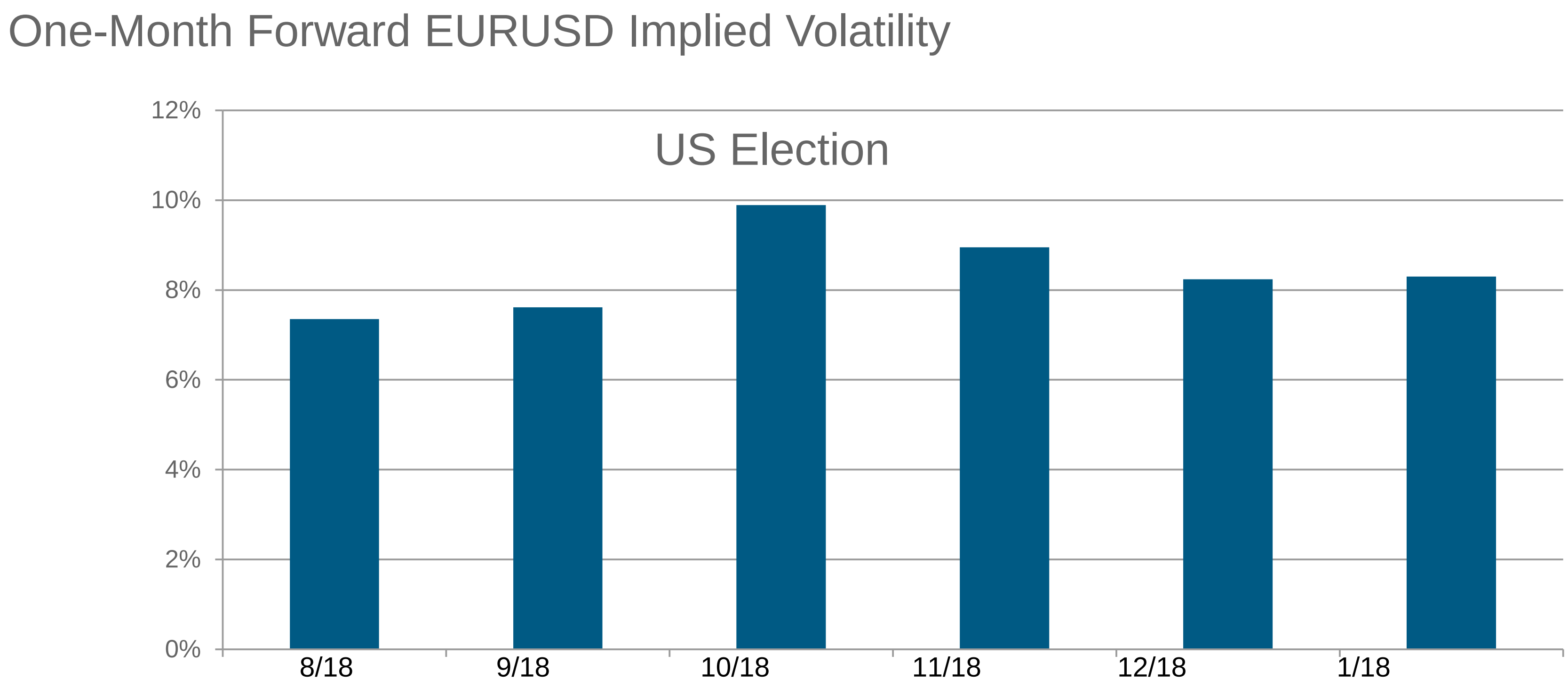
USDBRL Spot = BRL 3.22
Notional Exposure = USD 10M

1) 6M ATMF BRL 3.41 USD Call = **5.0%** = **$500K**
   - At expiry spot moves 15% = BRL 3.70
   - At maturity net payout = $350K

2) 6M BRL 3.41 one touch with net $350K payout = $257K or **2.6%.**
   - Could ladder strikes – e.g. another one-touch for 20% move - or use payout to buy more protection

- Forwards and vanilla options are fixated on the expected rate at expiry
- But one-touches can benefit from wedge between forwards and spot
- An equivalent cash payout can be cheaper to achieve via one touches
  - And less up front means less lost if hedge proves unnecessary

USING FORWARD IMPLIED VOL TO HEDGE FOR EVENT RISKS



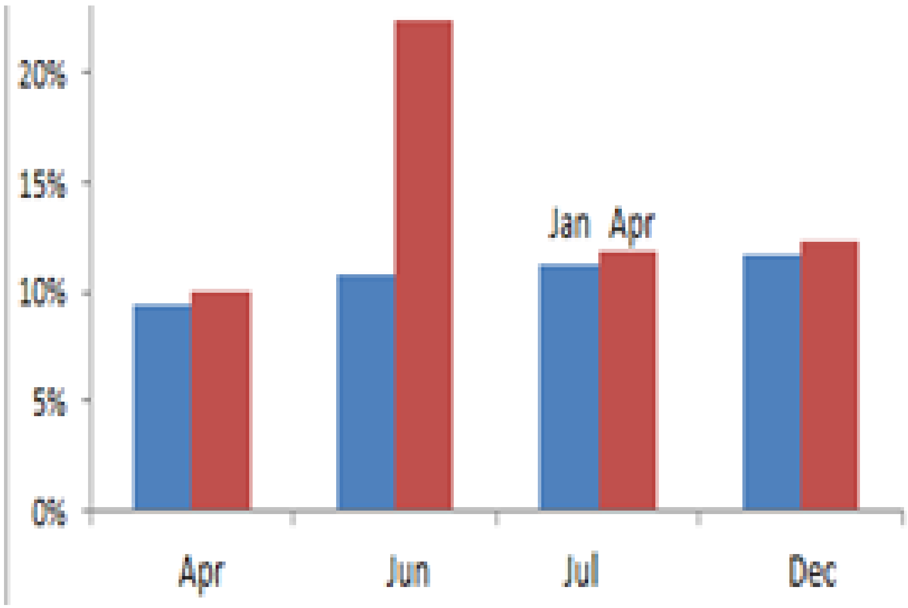
Source: Thomson Reuter Eikon

- Market tends to price quick mean reversion of vols after events
- Not that dramatic for the US Election
- But it did work well for BREXIT

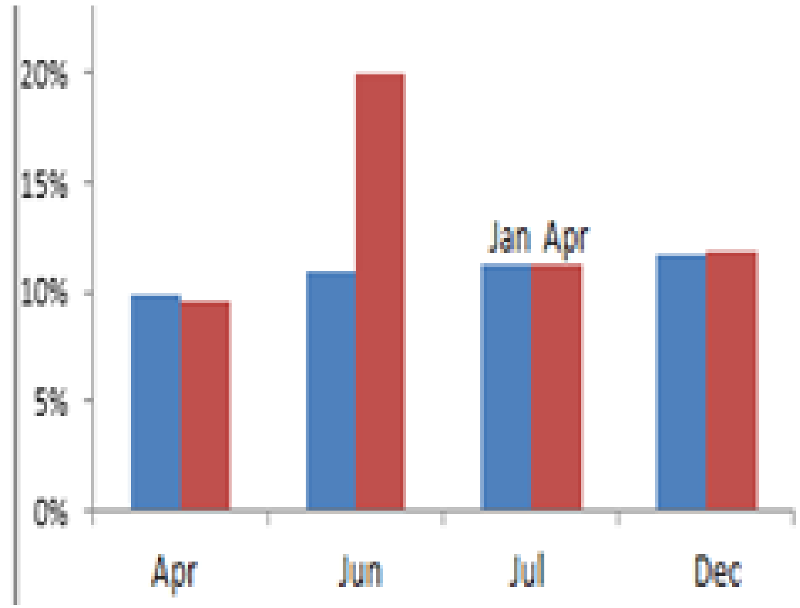
USING FORWARD IMPLIED VOL TO HEDGE FOR EVENT RISKS

One-Month Forward Implied Volatility

GBPUSD



EURGBP



Source: Thomson Reuter Eikon

- In April Forward implied vol for July was over 5% pts below June
- And was only marginally higher than pre-BREXIT
- July implied vol tested 20% in wake of the BREXIT yes vote

FINAL CONCLUSIONS

- Volatility generally headed to record lows
  - But FX volatility has been slower to decline
  - Aggressive central bank easing is bearish for volatility
  - But divergent policy is bullish specifically for FX volatility
- Even without discretion, hedging may require strategy
  - Carry levels can help determine hedge duration
  - Options are more attractive when vol is cheap
  - Extreme risk-reversal skew can create positive P/L bias
  - Liquidity maps can help guide preferred times to trade
  - And non-traditional options can reduce negative carry burden and help hedge specific event risk

QUESTIONS?

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