NOMURA
Connecting Markets East & West

EUR and USD Interest Rate Volatility

Themes, Flows and Ideas

Global Markets
Rates Options Trading
EMEA, US

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Contents

Interest Rate Volatility Trading @ Nomura

- A fully integrated EUR + USD and Vanilla + Exotics desk
- Near round the clock pricing, analysis, and trade idea generation services
- Traders present in Singapore, London and New York
- Competitive pricing in all time-zones

We see flows from:

1. Asia: Japan, Korea, Taiwan, China, India, Malaysia
2. Singapore & Hong Kong Hedge Funds
3. Middle East: UAE, Saudi Arabia, Israel and Turkey
4. Continental Europe: Germany, France, Italy, Spain
5. Nordic Region: Denmark, Finland and Sweden
6. UK: London based Hedge Funds, Asset Managers and Banks
7. US: Hedge Funds, Insurance, Mortgagers, Banks, Corporates and Asset Managers, Equity Funds, Credit Funds
8. South America: Chilean Private Banks

Source: Nomura International

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USD Vol Update

1. USD Market Snapshot

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USD

spot rates	Change (bps)	30-Dec-2022	16-Jun-2023
2y	20.8	4.43	4.64
5y	4.5	3.73	3.78
10y	-3.5	3.54	3.50
15y	-4.6	3.51	3.46
20y	-3.2	3.44	3.41
30y	0.4	3.19	3.19

spreads	Change (bps)	30-Dec-2022	16-Jun-2023
2s5s	-16.4	-0.70	-0.86
2s10s	-24.3	-0.89	-1.13
2s30s	-20.4	-1.24	-1.44
5s10s	-8.0	-0.20	-0.28
5s30s	-4.0	-0.54	-0.58
10s30s	3.9	-0.35	-0.31
20s30s	3.6	-0.25	-0.22

fwd rates	Change (bps)	30-Dec-2022	16-Jun-2023
1y1y	51.6	3.48	4.00
2y1y	9.1	3.20	3.29
3y1y	-12.4	3.22	3.09
2y2y	-1.5	3.21	3.19
3y2y	-14.5	3.22	3.08
5y5y	-14.4	3.32	3.18
10y10y	0.1	3.27	3.28
10y20y	6.7	2.88	2.95
20y10y	14.8	2.36	2.51

Vol Chg	3m	1y	2y	5y	10y	20y	30y
1m	-12.8	18.2	20.8	-6.3	-29.9	-34.2	-33.4
3m	10.3	15.3	10.4	-8.6	-25.8	-29.8	-31.1
6m	23.8	13.7	5.1	-12.9	-24.9	-28.6	-29.4
1y	16.2	3.2	-7.3	-18.5	-22.5	-24.2	-23.7
2y	-15.0	-14.0	-19.0	-21.3	-20.2	-20.6	-19.6
3y	-22.6	-20.6	-20.3	-19.6	-16.9	-16.5	-15.6
5y	-18.9	-16.9	-14.1	-13.8	-12.5	-10.2	-9.3
7y	-13.3	-12.8	-12.2	-11.0	-9.8	-7.2	-6.2
10y	-9.2	-9.2	-8.7	-7.3	-6.7	-4.2	-3.5
15y	-4.1	-4.1	-4.5	-2.9	-3.6	-2.4	-1.7
20y	-3.8	-3.8	-4.6	-2.7	-3.7	-2.3	-1.7

2. Structural Flows and Main Players

Gamma Vols

- Leveraged real money accounts program selling
- Fast money selling through forward vol structures
- Asset managers buying for selloff protection
- Hedge funds speculating on implied vs. realized moves
- Systematic Sellers for Theta Harvesting

Intermediate Vols

- Real money selling through structured notes issuance
- Fast money selling through forward vol structures
- Mortgagers/CVA buying for hedging purposes
- Insurance buying receivers or selling risk reversals for lower rate protection

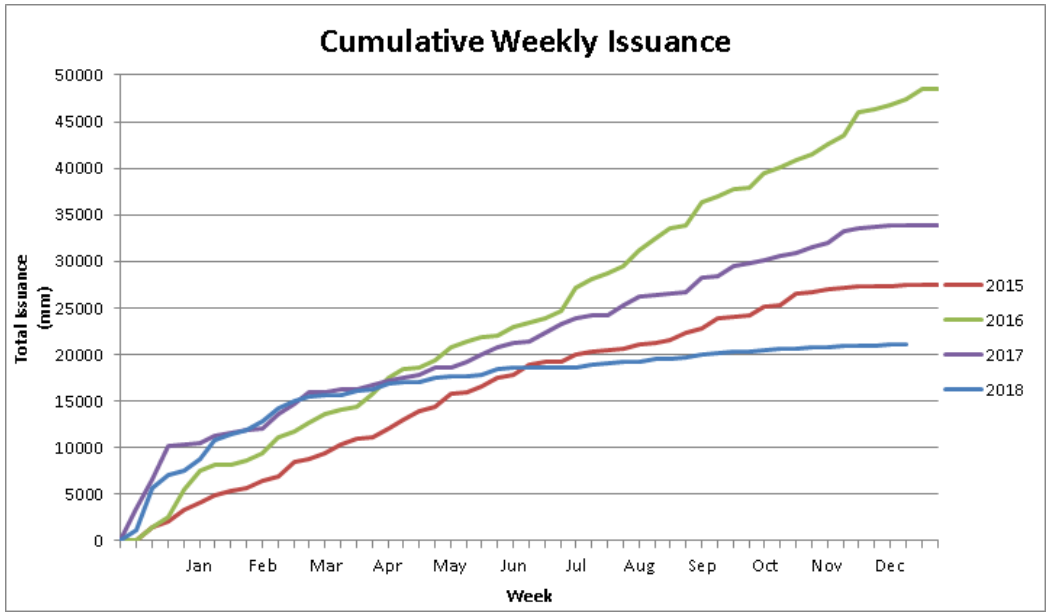
Long Dated Vols

- Real money selling through structured notes issuance
- Formosa callable issuance, typically 30y nc 1y to 5y accreters callable every year
- Fast money/Real money buying through forward vol structures
- RM buying outright payers as positive or neutral carry bearish trades

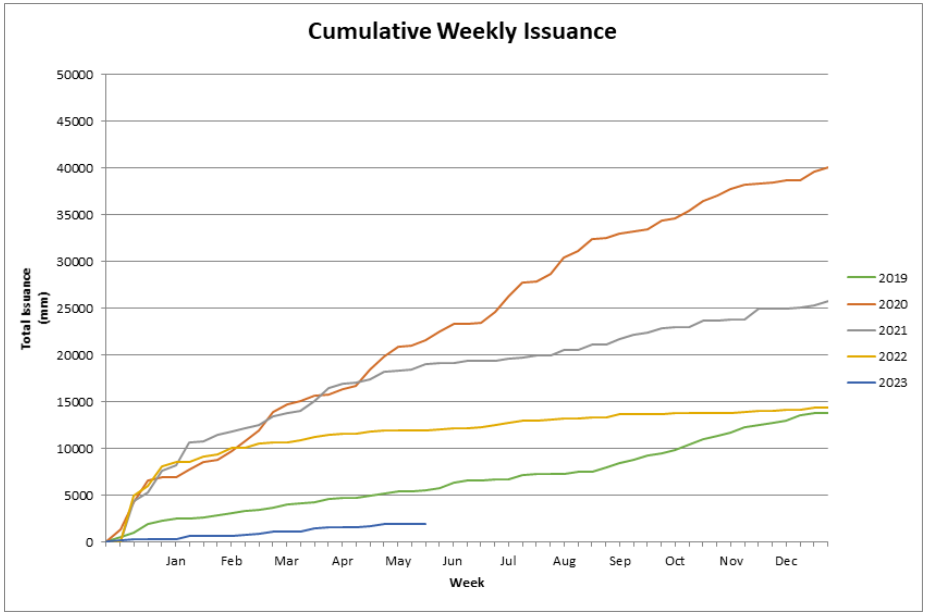
Source: Nomura internal

2. Structural Flows and Main Players

Formosa Issuance 2015 - 2018



Formosa Issuance 2019 - 2023



The USD Formosa Market has been the biggest structural flow in the USD vega market over the past decade or so.

- The flow really picked up after 2014 when the Taiwanese regulator opened the doors to lifers holding USD denominated bonds in their portfolios.
- The typical flow in the beginning was 30ync1y + 1y accreter bonds. The notional accreted at the rate of the coupon.
- As years went by the popularity of the product caused a lot of issuance in the market and heavy vega supply which peaked in 2016 when Trump won the US elections and caused a big sell-off in rates.
- Later the regulator imposed a restriction for the no-call period of these callables to be >= 5y. Further they added a limit on the USD holdings lifers can have on the balance sheet. The typical structure then moved to 30ync5y + 1y accreters.
- When back-end rates went lower in 2019, lifers went further out in the curve to issue 40y bonds to sell even more vol and increase pick-up on yields. The flows since then got somewhat 50-50 split between 30ync5y+1y and 40ync5y+1y structures.
- In the 2020 covid pandemic as banks and issuer credit spreads widened significantly, Lifers used that to max out their USD holdings in the sprit of locking in these high yields. Post 2021 the flows have started to really slow down.
- Lifers are now all close to or at their caps in terms of how much USD bonds they can hold. The depreciation of TWD against the USD has not helped the same as it increases the %-age USD holdings mechanically.

Source: Nomura internal

2. Understanding USD Vega dynamics

Callable/Structured Note Supply

Factors affecting USD Vega	Effect on Vega
Higher 30y swap rate, Increasing search for yield, increasing demand for new issuances	
Old Formosa callable being called and reinvested in new issues	
Rally in 30y swap rates, increased Vega demand for Vanna hedging on dealer berm books	
Forward vol demand from Hedge funds or real money clients	
Hedge funds buying/selling payer ladders	
Mean reversion trades: Hedge funds coming into buy/sell Vega on the fading the last trend move	

Typical structures

- Formosa callable: 30y nc 2y / 1y Accreter
- Libor range Accruals: Bonds that pay a fixed coupon as long as 3mL is between 0% and 6%
- Non inversion notes: Bonds that pay a fixed coupon as long as 2s10s > 0%
- Dual Range Notes: Bonds that pay a fixed coupon as long as 30s2s > 0% AND 3mL < 6%
- Callable Spread Options: Bonds that pay 4*(10y-2y) capped at 8%, floored at 0%, callable every year
- Forward Vol: 7y20y 3.5% payer vs. 2y5y20y 3.5% payer
- Vega Calendar spreads: 4y30y vs. 2y30y 4% payers
- Hedge Funds speculating on 10y10y straddles

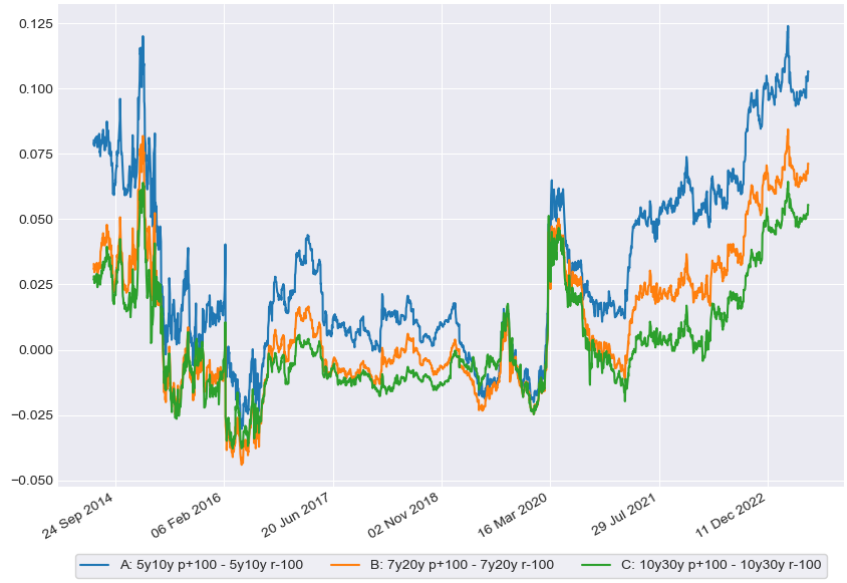
Source: Nomura internal

3. Vega Skew: Gone too far?

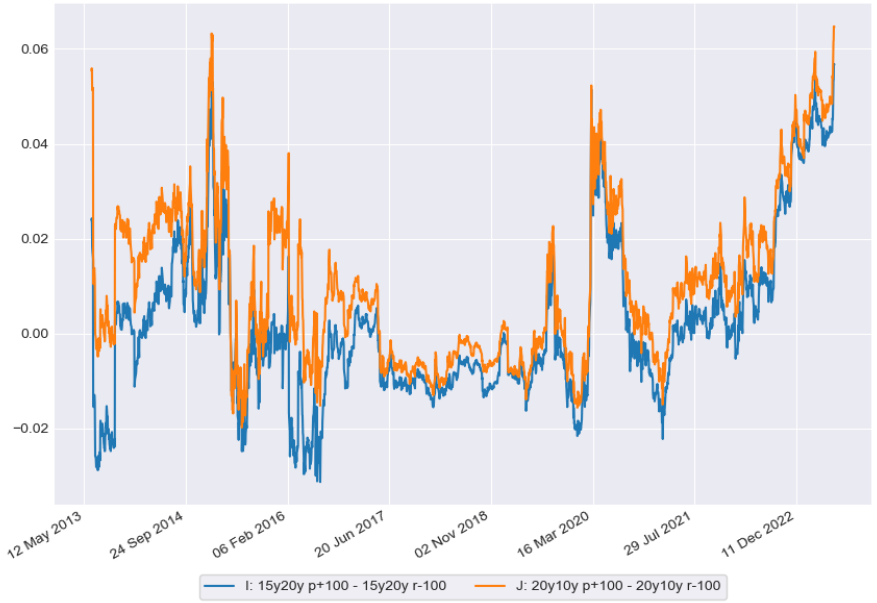
USD Vega skew is trading at or near all-time highs across all long tails and expiries. The entire sector has seen a sustained move higher for two and a half years now. It feels quite tempting to fade this now with the Fed coming closer to the end of the hiking cycle, but it is still good to understand what has brought the skew here in the first place.

- Vega skew was kept under check for years by Formosa callable issuance. Typically issuances would project vega to atmf+75 to atmf+125 strikes. Moreover, issuances in these years tended to pick up when the long end rates moved higher. The d(vega)/d(rate) dynamic of these callables also meant that dealers would get longer vega in a sell-off and shorter vega in a rally. This was also negative for the skew in longer expiries in particular.
- The RM and FM community over the years played USD vega from the long side, often taking the other side of the dips in vols caused by this supply.
- Post Taiwanese regulations kicked in and a flurry of activity during 2020 with wider credit spreads – Insurance companies reached their max limits of USD holdings. With the depreciation of the TWD against the USD, the percentage holdings of USD bonds also increased!
- We are now in a period where new issuance has dried up, and rates are higher than previous years which means we are past the peak of the callable vanna dynamics. Moreover the buy side community which held the vega supply from these callables now find that these are all “low strikes”. These market participants have been re-striking their USD vol exposures higher (to current atmf or higher strikes). This has caused an unprecedented demand for this skew causing a skew squeeze for the ages!
- Watch out for US Insurance and other RM buying of low strike receivers as a trigger for turning this around along with developments from the Fed.

5y10y, 7y20y and 10y30y +/-100 Risk Reversals (vol differential)



15y20y +/-100 and 20y10y +/-100 Risk Reversals (vol differential)



Source: Nomura internal

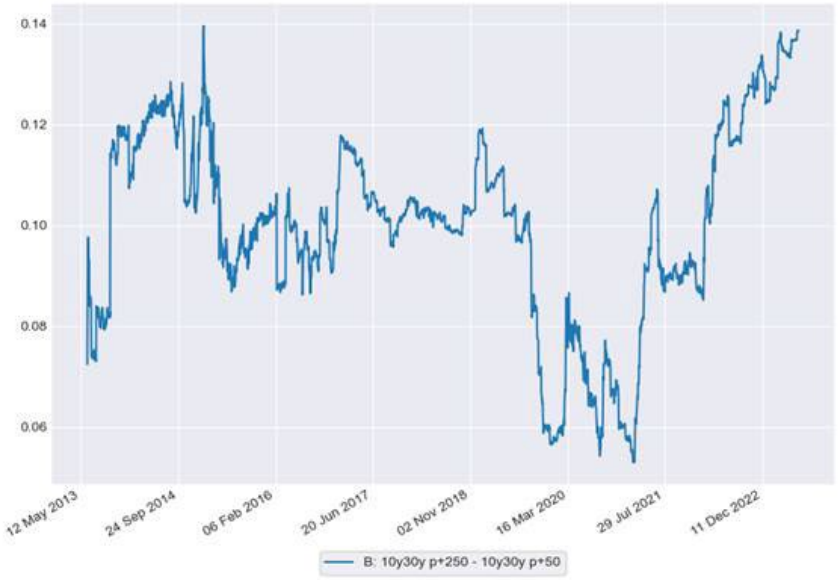
3. Vega Skew Trade Idea

Buy USD 100mm 10y30y 3.25% payer
Sell USD 160mm 10y30y 5.25% payer
Receive 17mm 10y fwd 30y swap @ 2.70%
Pay 515c FP on the 100mm notional

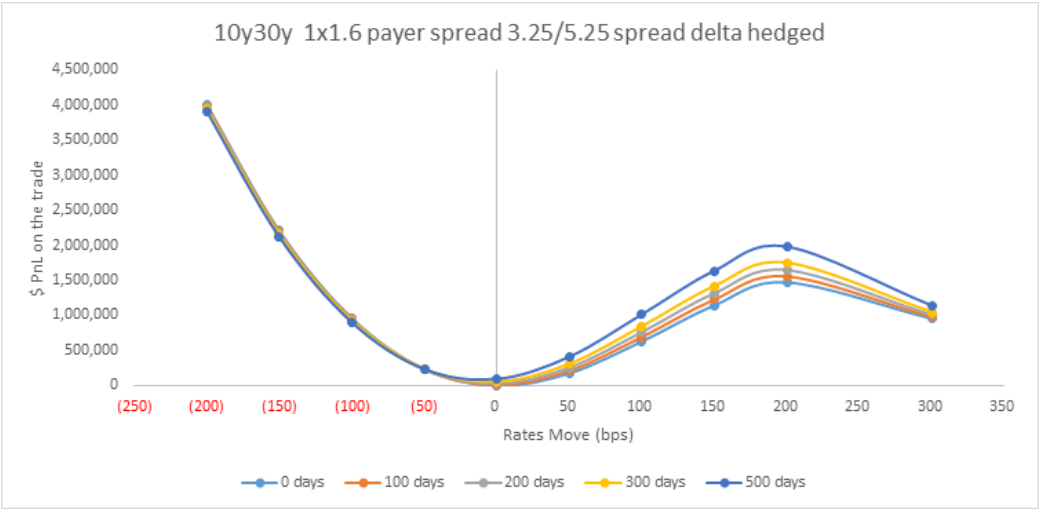
Implied vol mids: 64bpv and 78.2bpv respectively

- The trade is flat delta and flat vega at inception. It carries positively for 6 years and is long gamma for a very wide range of rates. The vol differential between the atmf+250 and atmf+50 payers is at 10y highs now.

10y30y atmf+250 – atmf+50 vol differential



PnL profile of the trade with rates move and passage of time



PnL profile of the trade with rates move and passage of time

time/rates (bps)	-200	-150	-100	-50	0	50	100	150	200	300
0 days	4,010,390	2,210,146	965,720	241,014	0	175,403	628,929	1,142,888	1,473,176	956,029
100 days	3,989,401	2,192,075	952,673	238,095	14,614	214,420	693,965	1,226,343	1,558,214	980,243
200 days	3,969,387	2,174,945	940,796	236,961	31,964	257,257	763,674	1,314,876	1,648,392	1,010,575
300 days	3,949,604	2,157,687	928,735	236,146	50,974	304,054	840,243	1,412,914	1,749,393	1,047,761
500 days	3,909,969	2,122,475	904,154	235,879	94,411	409,322	1,012,357	1,634,199	1,979,524	1,142,549

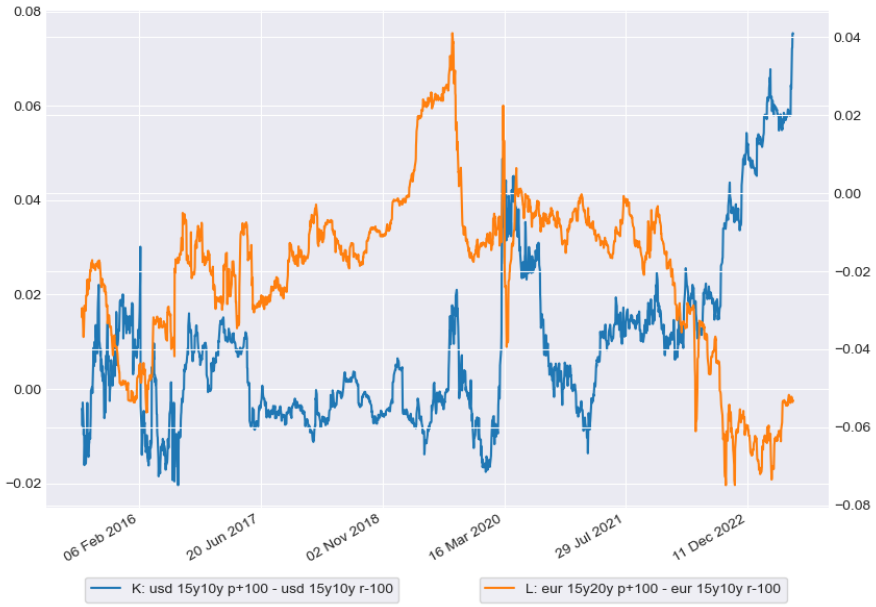
Source: Nomura internal

3. USD vs. EUR Vega Payer Skew

- Vega skew in USD and EUR have moved in opposite directions in the last 18 months or so. It is somewhat puzzling as one would imagine the same callable vanna dynamic exists in both currencies, albeit to different extents.
- We think the USD move has not crossed the Atlantic largely due to the fact that there wasn't as widespread a positon in EUR vol on the buy side being long vega. If anything for years leading up to the COVID pandemic and its follow through, the consensus position on the buy side for EUR vol was short – for carry. The ECB's dovish commitments post 2012 and 2014 had most selling EUR vega.
- In addition, receiver buying programs in EUR are well and truly underway for the past few months, ensuring pressure is kept on the skew.
- We think it might be an interesting cross-market skew play here to buy EUR collars and sell USD collars. One could even combine a rate view or a hedging need keeping in mind that this vega skew is actually a bit stretched (in opposite directions!) in both the currencies.
- **Sell USD 15y10y 200wc @ 96c FP vs. 58% delta @ 2.93% vs. Buy EUR 15y10y 200wc @ 28c FP vs. 63% delta @ 2.21%**
- USD implied vol mids 69bpv and 61bpv respectively, EUR implied vol mids 67.3bpv and 65.1bpv respectively

(200wc = two hundred wide collar, i.e. atmf+100bps payer minus atmf-100 bps receiver)

USD 15y10y 200wc (blue) & EUR 15y20y 200wc (orange)



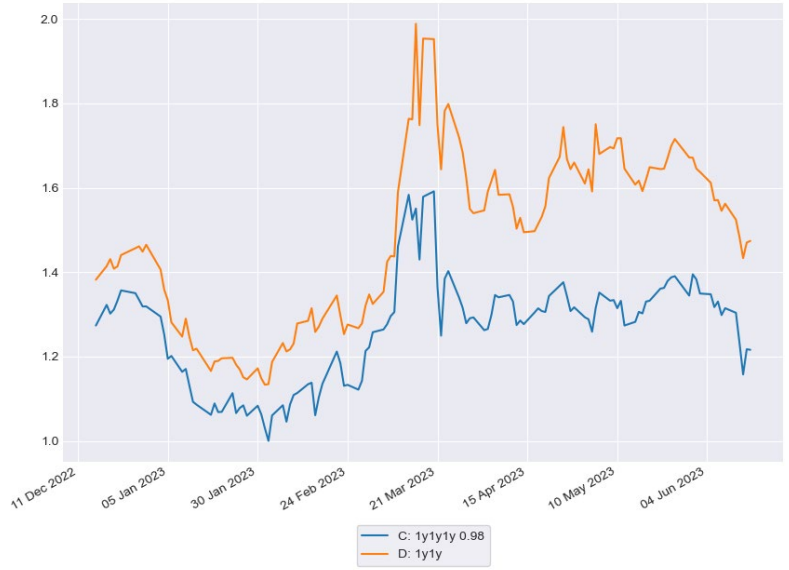
USD 10y20y 200wc (blue) & EUR 10y20y 200wc (orange)

4. Top Left Vols

- The strength of the USD top left vols both in realized and implied vols over the past couple of years has been one of the most interesting talking points in the vol markets. The pricing of the US front end curve at various instances in the hiking cycle has been at complete odds with the Fed rhetoric and that has baffled us at various junctures, but has also provided some very good trading opportunities.
- Tracking the roll down between 1y spot and 1y1y fwd has been quite interesting over this hiking cycle. While the market has priced deep and quick cuts from the Fed at various points in the cycle, employment and inflation data have both been strong causing sharp moves in rates in both directions.
- The regional banking crisis starting in March with Silicon Valley going bust caused major panic in the market, which resulted in the deepest cuts being priced in the front end of the USD curve.
- With rates high, future hikes certainly not off the table (in fact 2 more expected if the Fed dots are to be believed) and the market constantly trying to challenge the Fed – the path to more "normal" i.e. lower vols is unlikely to be smooth.
- With that in mind, consider buying USD 1y1y1y fwd vol @ 121bpv. With 1y1y spot vol which is around recent lows @ 148bpv provides a decent roll up. Also the 1y1y vol has not been significantly lower than this level for a large part of the hiking cycle and with rates > 5% and cuts being priced in and out on a relatively frequent basis, we think this vol will take longer to "normalize" than what the market might anticipate.

1y1y curve roll-down and 1y1y implied vol

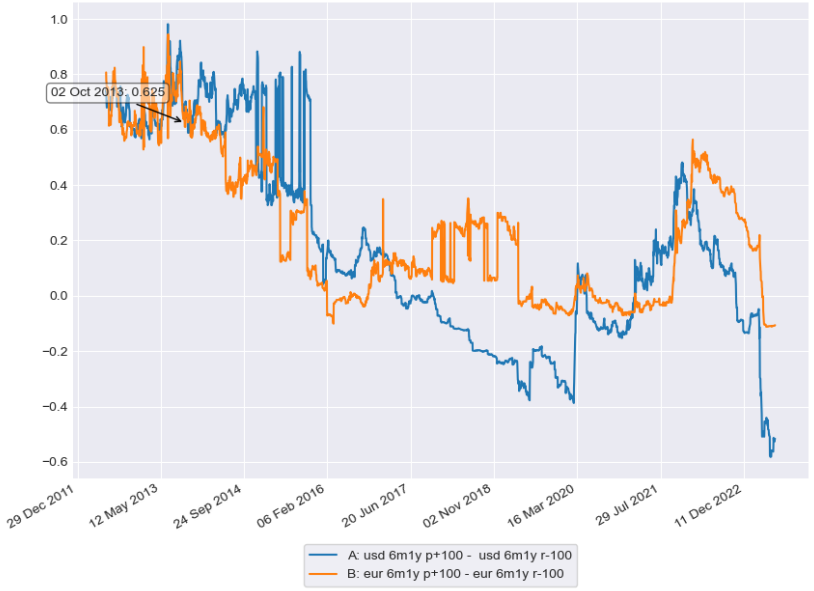
1y1y spot vol and 1y1y1y fwd vol



4. Top Left Vols: Skew

- The SVB crisis and its aftermath has had a lasting impact on the top left skew of the USD (and EUR) vol surface. Take the USD 6m1y +/-100 risk reversal for instance – the vol differential between the atmf+100 payer and atmf-100 receiver is > 50bpv! This is the all-time lows in this skew (payer minus receiver).
- While there is some justification for this skew given the experience in March where we got a > 100bps rally in the whites in just a couple of days and vols exploded > 100bpv, it does provide some odd day to day performances. The local realized skew is nowhere near as steep for the receiver or depressed for the payer.
- To add to this, a very interesting flow developed in the aftermath of the regional bank crisis. Federal home loan banks in the US issued more than **USD 75bn** of very short dated multi-callables during that time. The typical structure was **1y nc 3m +1m** callables with at coupon of roughly 5-5.25%. At the time the 1y rate was hovering around 4 to 4.5% and the pick up by selling the elevated vols was quite large even for short dated multi-callables. This made it a very attractive yield enhancement product which got a lot of take up from money market funds.
- While this flow satiated some of the dealer vol needs, it seemed to double up on the skew position on the street. The street had basically been short lower strikes at the time from corporate cap buying programs through this hiking cycle and some receiver buying for protection from Equity funds. This put further pressure on the skew bringing it to historically low levels.
- A few HFs are now buying payers in this area as a cheap “sticky inflation” and protection against Fed having to go >= 6% in rates. 6m1y 5.5% payer costs 9.5c spot premium and 6m1y 4% receiver costs 18.25c spot premium

USD 6m1v +/-100 risk reversal (vol differential)



PV change (cents) for various PCA scenarios for USD 6m1y 5.5% payer (ref 4.73%)

PVUSD Chg	-2	-1	0	1	2
-4	-4.9	-5.7	-6.2	-6.7	-7.1
-2	-1.6	-2.9	-4.0	-4.9	-5.6
0	3.8	1.8	0.0	-1.5	-2.8
2	11.8	8.9	6.3	3.9	1.9
4	22.4	18.6	15.2	12.0	9.0

PV change (cents) for various PCA scenarios for USD 6m1y 4.0% receiver (ref 4.73%)

PVUSD Chg	-2	-1	0	1	2
-4	7.2	9.4	11.8	14.4	17.2
-2	1.6	3.3	5.1	7.2	9.4
0	-2.7	-1.4	0.0	1.6	3.2
2	-6.1	-5.1	-4.0	-2.8	-1.5
4	-8.6	-7.8	-7.0	-6.1	-5.1

4. Top Left Vols: The FHLB Callable Flow Dynamics

- Studying the FHLB callable dynamics gives a good insight into the USD skew pricing in the very top left
- Below is the Change in Vega for various rate scenarios of the representative portfolio on the street

Representative Vega at Inception

	3m	1y	total
1m	2,149	7,520	9,669
3m	122,193	343,330	465,523
6m	259,469	170,078	429,547
1y	139,671	14,369	154,040
total	523,481	535,297	1,058,778

Vanna over rally scenarios

rates -100bps	3m	1y	total
1m	-2,093	-7,327	-9,420
3m	-108,766	-299,024	-407,790
6m	-254,065	-166,143	-420,208
1y	-136,493	-14,083	-150,575
total	-501,417	-486,576	-987,994

rates -50bps	3m	1y	total
1m	-1,622	-5,679	-7,301
3m	-60,698	-156,850	-217,549
6m	-196,513	-123,257	-319,770
1y	-109,426	-11,246	-120,672
total	-368,260	-297,032	-665,292

rates-25bps	3m	1y	total
1m	-909	-3,181	-4,090
3m	-25,275	-62,386	-87,662
6m	-110,825	-65,112	-175,937
1y	-67,041	-6,664	-73,705
total	-204,051	-137,343	-341,393

Vanna over sell-off scenarios

rates +25bps	3m	1y	total
1m	-526	-1,841	-2,367
3m	10,329	-44,333	-34,004
6m	122,246	93,911	216,157
1y	80,437	6,763	87,200
total	212,486	54,500	266,986

rates+50bps	3m	1y	total
1m	-584	-2,044	-2,628
3m	-53,672	-191,827	-245,500
6m	294,003	167,439	461,442
1y	158,454	11,898	170,352
total	398,201	-14,534	383,667

rates+100bps	3m	1y	total
1m	-1,098	-3,844	-4,942
3m	-85,355	-273,927	-359,282
6m	318,152	142,158	460,310
1y	267,570	15,612	283,182
total	499,269	-120,001	379,269

rates +150bps	3m	1y	total
1m	-1,597	-5,590	-7,188
3m	-105,200	-317,251	-422,452
6m	233,594	31,839	265,433
1y	324,653	24,812	349,465
total	451,449	-266,191	185,259

5. Gamma Spread Vol and VOV: The Summer Carry Hunt

- USD 3m 2s10s floor 1x2's and ladders have become very popular in the last few weeks as a summer carry trade. This has caused 2s10s spread vol to have a mini-collapse both in EUR and USD.
- Gamma vov has been gradually coming down for 2-3 years now in USD but 3m1y vov seems to have gone too far, such that the average vol of the wings is almost flat to the atm vol which means the wings are likely a good buy. In EUR the same is not true and might be a good candidate for a summer carry hunt!

USD and EUR 3m 2s10s spread vol

USD 3m1y and 3m10y strangle vs. straddle

EUR 3m1y and 3m10y strangle vs. straddle

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EUR Vol Update

1. EUR Market Snapshot

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EUR

spot rates	Change (bps)	30-Dec-2022	16-Jun-2023
2y	39.2	3.37	3.76
5y	6.2	3.17	3.24
10y	-8.0	3.13	3.05
15y	-3.9	3.07	3.03
20y	5.2	2.86	2.91
30y	17.4	2.46	2.63

spreads	Change (bps)	30-Dec-2022	16-Jun-2023
2s5s	-33.0	-0.20	-0.53
2s10s	-47.2	-0.25	-0.72
2s30s	-21.8	-0.91	-1.13
5s10s	-14.2	-0.05	-0.19
5s30s	11.2	-0.71	-0.60
10s30s	25.4	-0.67	-0.41
20s30s	12.2	-0.40	-0.28

fwd rates	Change (bps)	30-Dec-2022	16-Jun-23
1y1y	28.4	3.17	3.45
2y1y	1.0	2.97	2.98
3y1y	-22.6	2.95	2.72
2y2y	-9.7	3.02	2.92
3y2y	-25.8	3.02	2.76
5y5y	-24.9	3.08	2.83
10y10y	29.1	2.44	2.73
10y20y	40.1	1.93	2.33
20y10y	51.3	1.32	1.83

Vol Chg	3m	1y	2y	5y	10y	20y	30y
1m	-20.9	-42.8	-23.9	-31.0	-38.0	-39.8	-39.6
3m	-17.9	-39.5	-26.1	-33.9	-39.3	-39.3	-39.7
6m	-20.1	-28.8	-22.2	-29.1	-34.5	-32.9	-35.9
1y	-16.7	-13.6	-16.7	-24.3	-28.0	-26.8	-27.5
2y	-13.3	-10.4	-12.6	-19.1	-21.5	-21.6	-22.2
3y	-14.7	-11.8	-12.6	-16.1	-17.1	-17.6	-17.9
5y	-14.3	-12.6	-12.8	-11.7	-11.5	-11.6	-10.9
7y	-14.0	-12.8	-13.0	-10.1	-9.4	-8.6	-8.1
10y	-12.5	-12.5	-12.9	-10.2	-8.5	-6.9	-6.4
15y	-12.0	-12.0	-11.6	-10.3	-7.2	-5.3	-5.2
20y	-10.5	-10.5	-10.5	-9.2	-6.4	-4.5	-4.3

2. Understanding EUR Vega dynamics

Callable/Structured Note Supply

Factors affecting EUR Vega	Effect on Vega
Higher 30y swap rate, Increasing search for yield, increasing demand for new issuances	↓
Old German callable being called and reinvested in new issues	↓
Rally in 30y swap rates, increased Vega demand for Vanna hedging on dealer berm books	↑
Real money long end payer demand on 20y and 30y tails, sometimes vs. middle of the grid	↑
French CMS Demand, CMS cap spreads, CMS outright	↑
Mean reversion trades: Hedge funds coming into buy/sell Vega on the fading the last trend move	↓ ↑

Typical structures

- German callable supply, for example 40y nc 10y10y accreter
- French CMS caps and CMS cap spreads (10y 2%, 7% cap spread)
- Real Money buying of long dated payers on long tails sometimes vs. middle of the grid (20y20y P+50 vs. 5y10y P+100) taking advantage of the skew differential along with the vol differential
- Leverage steepeners, Enhanced Steepeners: Bonds paying leverage times (10y-2y) capped and floored. Sometimes just CMS10 capped and floored along with a 10s30s steepener as a kicker
- Vega Calendar spreads: 7y30y vs. 2y30y high strike payers
- Conditional steepeners: 5y 5s30s for zero cost
- Hedge Funds speculating on 10y10y straddles

Source: Nomura internal

3. CMS Triangles

- A nice way to fade CMS richness of long tails is to look at this CMS triangle

		FP indic mkt	
Buy 12y CMS	20s2s 2% Cap	15.25 / 17.75	*Model mid 17.1*
Sell 12y CMS	20y 12% Cap	(28 / 33)	*Model mid 23.4*
Buy 12y CMS	2y 10% Cap	(15.5 / 19.5)	*Model mid 16.5*
Can offer this for 8c indic		(indic market is 5.5 / 8)	*Model mid 10.1*

What is this trade?

- Limited downside – you cannot lose more than the initial premium of 8c FP
- If rates stay low then it is trivially just the spread option cap on 20s2s @ 2% (i.e. bull steepener)
- If rates are very high and the curve is steep the trade is a wash as the CMS caps are both ITM but the spread option saves you
- If rates are very high and (more likely) the curve is inverted then you are in the 20s2s flattener @ 2%

Note that the triangle is a lot cheaper (<50%) than the 2% Spread Option cap on its own.

Should the triangle be cheaper or more expensive than the SO cap?

It's interesting to look at the terminal payoffs of a) the triangle and b) the cap on their own:
Y axis is terminal 2y rate, X Axis is terminal 20y rate. Numbers shown are payoff (in basis points) for that terminal (x,y) point on the next slide

3. CMS Triangles

CMS Triangle Payoff Diagram

2y \ 20y	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	18	20	22	24
-2	0	0	0	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
-1	0	0	0	0	100	200	300	400	500	600	700	800	900	1,000	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100
0	0	0	0	0	0	100	200	300	400	500	600	700	800	900	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
1	0	0	0	0	0	0	100	200	300	400	500	600	700	800	900	900	900	900	900	900	900	900
2	0	0	0	0	0	0	0	100	200	300	400	500	600	700	800	800	800	800	800	800	800	800
3	0	0	0	0	0	0	0	0	100	200	300	400	500	600	700	700	700	700	700	700	700	700
4	0	0	0	0	0	0	0	0	0	100	200	300	400	500	600	600	600	600	600	600	600	600
5	0	0	0	0	0	0	0	0	0	0	100	200	300	400	500	500	500	500	500	500	500	500
6	0	0	0	0	0	0	0	0	0	0	0	100	200	300	400	400	400	400	400	400	400	400
7	0	0	0	0	0	0	0	0	0	0	0	0	100	200	300	300	300	300	300	300	300	300
8	0	0	0	0	0	0	0	0	0	0	0	0	0	100	200	200	200	200	200	200	200	200
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	100	100	100	100	100	100
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	0	0	0	0	0
12	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	100	0	0	0	0	0	0
13	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	200	100	0	0	0	0	0
14	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	300	200	0	0	0	0	0
16	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	500	400	200	0	0	0	0
18	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	700	600	400	200	0	0	0
20	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	900	800	600	400	200	0	0
22	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,100	1,000	800	600	400	200	0
24	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,300	1,200	1,000	800	600	400	200

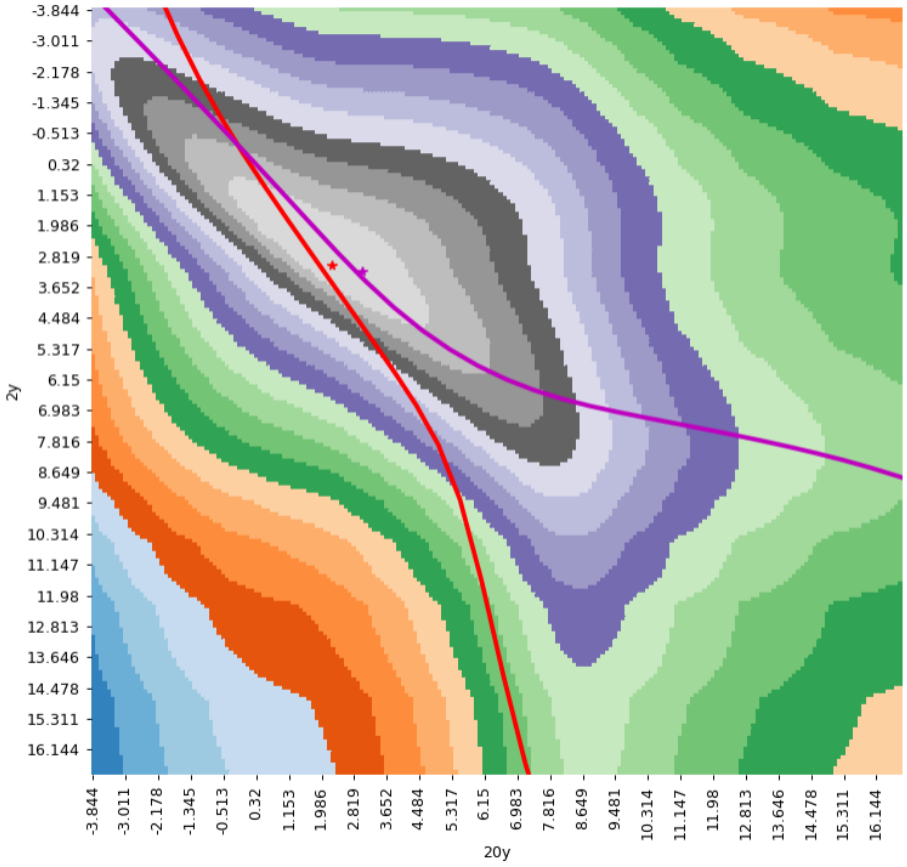
Comparison Payoff Diagram of the Spread Option on its own

2y \ 20y	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	18	20	22	24
-2	0	0	0	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,600	1,800	2,000	2,200	2,400
-1	0	0	0	0	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,500	1,700	1,900	2,100	2,300
0	0	0	0	0	0	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000	2,200
1	0	0	0	0	0	0	100	200	300	400	500	600	700	800	900	1,000	1,100	1,300	1,500	1,700	1,900	2,100
2	0	0	0	0	0	0	0	100	200	300	400	500	600	700	800	900	1,000	1,200	1,400	1,600	1,800	2,000
3	0	0	0	0	0	0	0	0	100	200	300	400	500	600	700	800	900	1,100	1,300	1,500	1,700	1,900
4	0	0	0	0	0	0	0	0	0	100	200	300	400	500	600	700	800	1,000	1,200	1,400	1,600	1,800
5	0	0	0	0	0	0	0	0	0	0	100	200	300	400	500	600	700	900	1,100	1,300	1,500	1,700
6	0	0	0	0	0	0	0	0	0	0	0	100	200	300	400	500	600	800	1,000	1,200	1,400	1,600
7	0	0	0	0	0	0	0	0	0	0	0	0	100	200	300	400	500	700	900	1,100	1,300	1,500
8	0	0	0	0	0	0	0	0	0	0	0	0	0	100	200	300	400	600	800	1,000	1,200	1,400
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	200	300	500	700	900	1,100	1,300
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	200	400	600	800	1,000	1,200
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	300	500	700	900	1,100
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	400	600	800	1,000
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	300	500	700	900
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	400	600	800
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	400	600
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	400
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

3. CMS Triangles

- An interesting way to visualize this relative value is to look at the joint distribution of 2s and 20s
- The heat map is the joint PDF of the EUR 2s and 20s (2s on y-axis, 20s on x-axis)
- The purple line is the zero cost version of the 12y CMS 20 vs. 12y CMS 2 caps
- The red line is the zero cost version of the 12y 2s20s vanilla bear steepener

12y CMS 2y and 20y Joint PDF



Excess payoff of the triangle minus the regular SO cap

2y \ 20y	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	18	20	22	24
-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100	-200	-400	-600	-800	-1,000	-1,200
-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100	-200	-400	-600	-800	-1,000	-1,200
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100	-200	-400	-600	-800	-1,000	-1,200
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100	-200	-400	-600	-800	-1,000	-1,200
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100	-200	-400	-600	-800	-1,000	-1,200
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100	-200	-400	-600	-800	-1,000	-1,200
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100	-200	-400	-600	-800	-1,000	-1,200
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100	-200	-400	-600	-800	-1,000	-1,200
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100	-200	-400	-600	-800	-1,000	-1,200
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100	-200	-400	-600	-800	-1,000	-1,200
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100	-200	-400	-600	-800	-1,000	-1,200
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100	-200	-400	-600	-800	-1,000	-1,200
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100	-200	-400	-600	-800	-1,000	-1,200
11	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	-100	-300	-500	-700	-900	-1,100
12	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	100	0	-200	-400	-600	-800	-1,000
13	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	200	100	-100	-300	-500	-700	-900
14	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	300	200	0	-200	-400	-600	-800
16	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	500	400	200	0	-200	-400	-600
18	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	700	600	400	200	0	-200	-400
20	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	900	800	600	400	200	0	-200
22	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1100	1000	800	600	400	200	0
24	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1300	1200	1000	800	600	400	200

3. Zero wide collars

A few things have been happening that have an impact on 0-wide collar pricing:

- The vol tail slope is stretched for short tails vs long tails i.e. short tails are (rightly) trading well over longer tails
- There is a lot of new CMS printing and old CMS caps have come to life with rates and vols up here
- 5y10y and 10y10y 0-wide collars have traded in good size in the market (thanks to 1 motivated seller)

0) What is a Zero-wide collar?

Let's use 100m 5y10y as an example, it is this package of 4 trades:

+100m x 5y10y 2.90% payer (Cash IRR)
-100m x 5y10y 2.90% Receiver (Cash IRR)
-98.8m x 5y10y 2.90% payer (CCP LCH ESTR)
+98.8m x 5y10y 2.90% Receiver (CCP LCH ESTR)
Where 2.90% is the 5y10y ATMF (*16th Jun 2023)*

The Cash IRR collar is a synthetic swap where the PV01 is calculated in the cash formula style, i.e.

Payoff of collar = (**S** – 2.90%) x ANNUITYFORMULA(**S**)
Where **S** = 10y **ICE** Swap rate at expiry

ANNUITYFORMULA is a function purely of the swap rate and is just the geometric progression sum formula, in this case (1- 1/(1+**S**)^10)/**S**

The CCP LCH ESTR collar is a synthetic 5y fwd 10y swap which will settle onto LCH (or equivalent cash amount)
The notional of 98.8m is the delta flat amount for 100m of the cash IRR collar
We trade the CCP LCH ESTR collar as the hedge rather than the 5y fwd 10y swap as it keeps the delta bilateral (rather than an up/down between bilateral and cleared)

So it's just a formula swap settling onto the ICE fix vs a regular swap settling onto the clearing house

Source: Nomura

3. Zero wide collars

1) Why does vol tail slope matter?

When shorter tail vol is higher than long tail vol then it means (to first order) the market will bear flatten and bull steepen. Think about the swaps above, if you are long the cash IRR 0-wc and the market sells off then you make money on the Cash IRR annuity and lose on the real annuity. i.e. your discounting on the gains is all at the 10y swap rate, but your discounting on the losses is on the whole curve. So bear flattening is good for you.

To see this easily, look at the delta of the package and how it changes in a 100bp selloff: it starts off flat then becomes a messy curve.

We can price these collars in a toy model that assumes rates move in the atm vol ratio (with some correlation effect built in). This gives us a way to produce a fair (ish) value for these structures.

	Base	+100bp Selloff
1M	0	0
3M	0	0
6M	0	0
4Y	0	0
5Y	-208	-1,720
6Y	-1	383
7Y	-2	450
8Y	-4	521
9Y	-4	497
10Y	-11	1,010
12Y	-33	2,299
15Y	560	-3,079
20Y	1	-71
25Y	0	-1
30Y	0	0

Toy Model (vol surface shape aware):

	5y	10y	15y	20y	25y	30y
2y	1.2	7.1	13.9	18.6	18.1	17.9
3y	2.4	11.6	18.4	23.6	23.9	25.9
5y	4.1	15	24.6	30.9	32.1	37.3
10y	3.3	16.7	32.9	49.5	55.4	69.5
12y	2.8	17.4	38.7	56.5	64.8	82.5
15y	2	18.8	49.7	68.8	81.4	104.3
20y	1.4	20.6	57.5	92.9	116.8	156.2

And FYI our production model (which takes a slightly different approach):

	5y	10y	15y	20y	25y	30y
2y	0.4	3.1	7.1	13.2	18.9	25.1
3y	0.5	4.2	9.8	18.2	25.9	34.3
5y	0.8	6.1	14.2	26.3	37.4	49.5
10y	1.2	10.1	23.1	42.4	60.3	79.2
12y	1.7	11.6	26	47.4	67.3	88.3
15y	2.5	13.6	29.6	52.9	75	98.3
20y	4.2	16.6	34.5	58.5	82.3	107.1

Source: Nomura

3. Zero wide collars

2) What does this have to do with CMS?

CMS is different from vanilla products in 2 main ways:

A CMS payoff is **purely** a function of ICE swap rate with no adjustments and not linked explicitly to any clearing house (CCP Cash settled Swaptions that reference ICE look like they are also just a function of the ICE swap rate but in fact they are not). They are confirmed with reference to a clearing house so that if the ICE swap rate ever deviates from the referenced clearing house then an adjustment is made
A CMS payoff has many strikes (it is effectively a basket of replicating strikes)

We can see the sympathy between a) above and Cash IRR settled swaptions now. You can cover your local dynamics quite well with Cash IRR delta (i.e. 0-wide collars). The local dynamics being the curve effects mentioned above, and also the other dynamical feature which is Estr/Bor basis as rates move around. b) is not helped at all by hedging your delta with 0-wc.

I would say the above is all quite well understood by the market but now here is the **spanner in the works**:

Dealers who trade CMS end up with a large inventory of RECEIVED delta in CMS (ICE fix) vs paid delta on LCH.
This is matched as long as the ICE fix remains anchored to LCH but this is only the case through convention.
I see a clear (perhaps even likely) scenario where more trading on EUREX could start to demand attention from the ICE fix as a benchmark, with EUREX trades contributing in a blended way to ICE fix
This would result in CMS delta migrating from LCH to some random blend of LCH/EUREX basis giving dealers an overnight headache
This means LCH delta will need to be replaced with ICE delta, which would create demand for 0-wide collars as the path of least resistance (the only alternative being CMS itself which is harder to buy)

3) So what is the trade?

If you have any received **ICE delta** (from either Cash irr swaptions or CMS) I would cover it via zero-wide collars. The motivated seller has offered liquidity so not a bad time to take it. It is only in 5y10y to 10y10y though, so you might have to take the basis between what you have and these points.

Source: Nomura