

Global Rates and FX Primer

FX Quant Insight: decipher weekly FX signals

Key takeaways

- This is an overview of the FX Quant Insight report that we will publish on Monday evenings in New York.
- The FX Quant Insight report proposes an FX Trade of the Week to express our high-conviction short-term FX views.
- The report discusses option flows, key positioning levels, cross-asset signals, and interactive time-zone plots.

The FX Quant Insight framework

In the long-run, exchange rates should converge toward the equilibrium rate. In the medium-term, relative monetary and fiscal policies play a major role in driving exchange rate fluctuations. For the short-term, we see trends and flows as key drivers and synthesize four quantitative components every Monday to form “FX Trade of the Week”:

1. **Option Flow Signals:** we use weekly shifts of the FX vol curves and SDR (Swap Data Repository) data to get signals for the coming week from options.
2. **Technical Matrix:** we use BofA FX positioning analysis, ADX, Bollinger bands, support and resistance levels to derive a signal by quantifying FX trends.
3. **CARS Signals:** the BofA CARS model uses cross-asset factors to makes weekly predictions for G10 FX in a systematic fashion.
4. **Interactive Time Zone:** investors can examine historical cumulative returns at different hours of the day and variable lookback periods for G10 FX.

These four components cover different aspects of the FX market, and the weekly FX Quant Insight publication will summarize key takeaways from each component as shown by the Exhibit 1 example to form a short-term FX view for the coming week.

Exhibit 1: Sample FX Quant Insight front page provides concise and coherent summary of signals

Sample top signals from four different components of FX Quant Insight using July and August data

Section	Insight	Rationale
Option Flow Signals	Bullish USD/CNH	Rising put skew and implied vol are bearish for CNH vs the USD.
Technical Matrix	Bullish USD/CNH	Positioning analysis shows uptrend continuation signal for USD/CNH.
CARS Signals	Bullish EUR	CARS is bullish EUR, AUD, and bearish CAD on equity factor.
Interactive Time Zone	US hour USD supply	Investors broadly sold USD during 10am-1pm ET the previous week.

Source: BofA Global Research. This is a sample view of the front-page table for the new FX Quant Insight publication and does not indicate any Research views. Snapshot as of 07/18/2022 for Option Flow, CARS, and Time Zone, and as of 8/8/2022 for Technical Matrix.

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G10 FX Strategy
Global

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CARS (model): Cross-Asset Regime Switching

SDR: Swap Data Repository

MAA: Moving Average Aggregator

UD: Up/Down volatility

RS: Residual Skew

ADX: Average Directional Movement Index

DMI: Directional Movement Index

Trading ideas and investment strategies discussed herein may give rise to significant risk and are not suitable for all investors. Investors should have experience in FX markets and the financial resources to absorb any losses arising from applying these ideas or strategies.

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Refer to important disclosures on page 11 to 13.

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Option Flow Signals

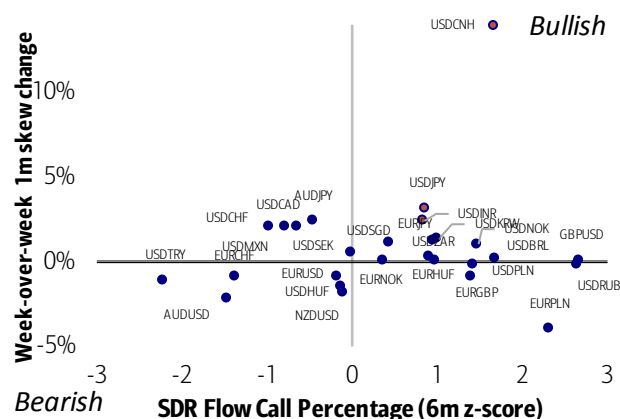
Our options flow signals combine Event analysis framework ([FX Viewpoint: Vol-guided decisions 18 March 2021](#)) with SDR (Swap Data Repository) flows data ([FX Viewpoint: SDR: What do FX options flows tell us? 01 February 2021](#)) to gauge bullish and bearish sentiments.

Option flow offers preview of future spot moves

As FX options expire in the future, we can effectively use option flows in the recent past as a proxy for investors' expectation of future spot movements and gauge directional risks. Exhibit 2 plots the call percentage z-score (at 6m lookback) of the FX options transactions in the previous week with 3m or less tenors as reported by the SDR along the x-axis. Along the y-axis, it plots the week-over-week 1m skew (25-delta risk reversal divided by atm vol) change. Option flows show bullish spot signals for FX pairs that fall in the top-right quadrant, as demand has been in favor of out-of-the-money (OTM) calls for these pairs. By contrast, option flows have been bearish for pairs that fall in the bottom-left quadrant. In this example (July 18), we find high demand for OTM USD calls vs a slew of currencies in Asia, particularly against the CNH (Exhibit 2).

Exhibit 2: Option flow was bearish CNH, JPY and INR

1m skew change vs call percentage z-score as of July 18 2022

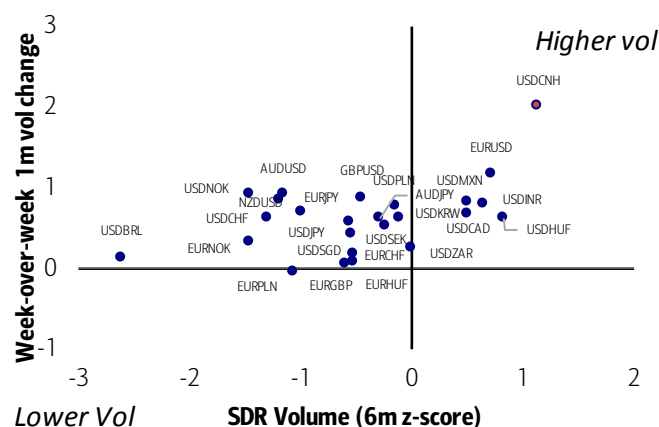


Source: BofA Global Research, DTCC. Note: CNH flows are proxied by "CNY" flows in SDR. Snapshot as of July 18 2022. SDR data is collected for transactions in the previous week for <3m tenor options.

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Exhibit 3: Elevated investor demand for CNH vol

1m implied vol change vs volume z-score as of July 18 2022



Source: BofA Global Research, DTCC. Note: CNH flows are proxied by "CNY" flows in SDR. Snapshot as of July 18 2022. SDR data is collected for transactions in the previous week for <3m tenor options.

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Option flow also pinpoints focal point of the market

Similarly, we can plot the previous week's SDR volume z-score vs week-over-week 1m vol change to gauge which pairs have caught the market's attention. We measure rising options demand by rising SDR flow volumes coinciding with a pick-up in implied vol. Exhibit 3 shows USDCNH had the highest trading volume over the past week as reported by SDR, and saw the biggest rise in level of vol over the past week (as of July 18).

Event analysis: vol guided decisions

Following a significant currency move (a rally or a sell-off), investors often face the dilemma of either chasing the move or fading it. We believe the FX options market can provide valuable information about positioning and sentiment, so we have also developed a framework called the Event analysis that uses the level of volatility, skew and term structure to help with such decisions ([FX Viewpoint: Vol-guided decisions 18 March 2021](#)).

Given the current spot trend could be rising or falling and the overall option signal could be bullish or bearish as well, we derive four strategies through historical scenario analysis:



- Bearish Continuation: sell a currency whose depreciation is accompanied by a parallel shift higher across the vol curve and a rise in put skew.
- Bearish Contrarian: sell a currency whose appreciation is accompanied by an increase in put skew.
- Bullish Continuation: buy a currency whose appreciation is accompanied by a relative inversion of the vol curve and a decline in put skew.
- Bullish Contrarian: buy a currency whose depreciation is accompanied by a fall in 1m vol and a decline in put skew.

Exhibit 4 summarizes spot and vol moves for major currency pairs over the past week (as of July 18). Since the Event analysis may not produce a signal every week, we highlight bullish or bearish conditions that have been partially satisfied by green and red shading, respectively. In this example, the Event analysis showed a moderate bullish continuation signal for the EUR as the vol curve inversion and skew conditions had been satisfied, but the currency's rally fell short of the 2% threshold over the past week (Exhibit 4).

To learn more about FX volatility and options please refer to our [FX Volatility Dashboard](#) as well as the FX Vol Dashboard Primer ([Global Rates and FX Primer: 09 March 2022](#)).

Exhibit 4: Event analysis was moderately bullish EUR

Event analysis signals for July 18 2022

Pair	Old spot	New spot	1m vol	1m vol chg	1y vol	1y vol chg	1y - 1m chg	Currency	Return vs USD	1m skew % chg vs USD	Signals
EURUSD	1.0040	1.0167	12.39	0.38	10.19	-0.04	-0.42	EUR	1.26%	2.46	EUR No Signal
USDJPY	137.44	138.16	12.15	-0.28	11.22	0.16	0.43	JPY	-0.52%	-0.52	JPY No Signal
GBPUSD	1.1892	1.1994	12.36	0.30	11.26	0.29	-0.01	GBP	0.85%	1.12	GBP No Signal
USDCHF	0.9832	0.9768	9.65	0.23	9.29	0.14	-0.09	CHF	0.65%	-0.61	CHF No Signal
AUDUSD	0.6734	0.6834	13.71	0.10	12.86	0.15	0.05	AUD	1.47%	-0.71	AUD No Signal
USDCAD	1.3007	1.2922	8.70	-0.14	8.60	0.06	0.20	CAD	0.66%	0.10	CAD No Signal
USDSEK	10.6393	10.3446	15.34	-0.24	13.49	-0.17	0.07	SEK	2.81%	0.69	SEK No Signal
USDNOK	10.2029	10.0619	16.27	0.19	14.82	-0.05	-0.24	NOK	1.39%	1.62	NOK No Signal
NZDUSD	0.6111	0.6169	13.60	0.16	12.79	0.20	0.04	NZD	0.94%	-0.32	NZD No Signal
USDSGD	1.4060	1.3960	6.60	0.56	5.61	0.14	-0.42	SGD	0.71%	-0.89	SGD No Signal
USDKRW	1303.9	1317.3	10.56	0.28	10.16	0.22	-0.06	KRW	-1.02%	-0.98	KRW No Signal
USDMXN	20.7399	20.4150	13.75	0.29	13.41	0.11	-0.18	MXN	1.58%	-0.30	MXN No Signal
USDTRY	17.3770	17.4589	26.04	-1.74	41.97	-0.09	1.64	TRY	-0.47%	-0.89	TRY No Signal
USDZAR	17.1074	17.0982	17.14	-0.02	16.85	0.05	0.08	ZAR	0.05%	0.31	ZAR No Signal
USDHUF	405.5	393.2	21.58	0.05	18.84	0.23	0.18	HUF	3.06%	2.70	HUF No Signal
USDPLN	4.7836	4.6995	16.83	-0.30	15.24	-0.19	0.11	PLN	1.77%	1.97	PLN No Signal

Source: BofA Global Research, Bloomberg. Snapshot as of July 18 2022.

The table shows the 1-year percentile and 1-week change in 1m and 1y implied vol, the 1y-1m spread, and the 1m 25 delta risk reversal as a percentage of the ATM. For a currency with a put skew, the rules for generating the signal column are the following:

[1] Bearish Continuation: Spot change < -1%, 1m vol change > 0.5%, 1y vol change > 0%, 1m skew chg. < -2; [2] Bearish Contrarian: Spot change > 1%, 1m skew change < -2;

[3] Bullish Continuation: Spot change > 2%, 1y-1m change < -0.1%, 1m skew change > 2; [4] Bullish Contrarian Spot change < -1%, 1m vol change < -0.2%, 1m skew chg. > 1.

Parameters that triggered a bearish condition are colored in red; parameters that triggered a bullish condition are colored in green.

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Option Flow signals were bullish USD/CNH and moderately bullish EUR

Overall, for the sample data as of July 18, the highest conviction signal from option flows was bullish USD/CNH on rising skew and volume. As shown from the Event analysis, options flow signals were also moderately bullish for the EUR at the time.

Technical Matrix

The Technical Matrix is a table of technical indicators ([Get to know even more technical strategy, 24 January 2022](#)) and BofA positioning analysis ([Global Rates and FX Primer: 01 October 2018](#)) that look at trend following and reversal signals.

The BofA G10 FX positioning analysis model with MAA, UD and RS

Our positioning analysis model gauges positioning using three proprietary indicators: Moving Average Aggregator (MAA), Up/Down volatility (UD) and Residual Skew (RS).

The daily MAA is the average of the 28 binary conditions given by comparing various short and long simple moving average pairs (SMA), such as whether the 50d SMA is above or below the 200d SMA (See Exhibit 5 footer for full list of SMAs). For many investors, a conventional bullish signal for a currency pair occurs when: the short-dated moving average is crossing above the long-dated moving average. The MAA reaches 100% when 28 moving average pairs are bullish, while it reaches 0% when 28 pairs are bearish. Similarly, the MAA is at 50% when 14 out of 28 pairs are bullish and 14 other pairs are bearish. A high (low) percentage of buy signals suggests long (short) positioning in the pair is quite heavy.

We construct Up/Down vol indicator as a spread of realized volatility between up and down days over the past month. Higher volatility in direction of the trend is bullish, while significant volatility against the trend is bearish. For the Technical Matrix, we normalize UD such that a high (low) value corresponds with greater down (up) vol, so that low values of UD may be interpreted as low positioning.

Following the intuition of the Event analysis, we construct Residual put Skew indicator as a residual of a regression of weekly changes in 1m 25d risk reversals (% atm) on weekly changes in spot over 6 month rolling window. Using a normalized cumulative sum of these residuals over the previous month, we get a measure of contrarian and trend-following signals from skew. We then take the 1-year percentile to normalize the RS indicator. Low RS values reflect light positioning and excess demand for calls, while high values reflect excess demand for puts and relatively stretched long positioning.

Trend continuation and reversals with positioning analysis

We consider a pair to be in uptrend if the MAA is above 60%, and in downtrend if the MAA is below 40%. The positioning analysis shows uptrend reversal signal if MAA, UD and RS are all above 80 and uptrend continuation signal if MAA is above 60 while UD and RS are below 50. The model shows downtrend reversal signal if MAA, UD, and RS are all below 20 and downtrend continuation signal if MAA is below 40 while UD and RS are above 50.

Exhibit 5 shows the trend determined by MAA in the Positioning Trend column. The Bullish/Bearish column indicates the signals from MAA, UD, and RS. It shows “Bullish” (in green) if positioning analysis has uptrend continuation or downtrend reversal signals for the pair, and “Bearish” (in red) if positioning analysis has downtrend continuation or uptrend reversal signals for the pair. The column shows “Slightly Bullish” or “Slightly Bearish” (in yellow) if only one of UD or RS indicators supports the signal. In the example as of August 8 2022 (Exhibit 5), positioning analysis was bullish USDJPY, AUDJPY, and USDCNH, and bearish AUDUSD and NZDUSD.



Exhibit 5: Technical Matrix was bearish JPY vs USD and AUD and bullish USD vs CNH

Technical Matrix with positioning analysis and key levels to watch as of Aug 8, 2022

		Spot	Positioning Trend	Bullish/Bearish	ADX Trend	Bollinger Bands	Next Support	Next Resistance
USD	EURUSD	1.0194	↓	No Signal	Downtrend	None	0.9952	1.0363
	USDJPY	135	↑	Bullish	Downtrend	None	130.87	135.02
	GBPUSD	1.2079	↓	No Signal	Transition	None	1.1760	1.2169
	AUDUSD	0.6984	↓	Bearish	Range	None	0.6950	0.7056
	USDCHF	0.9555	↓	No Signal	Range	None	0.9461	0.9577
	USDCAD	1.2858	↑	No Signal	Range	None	1.2788	1.2866
	NZDUSD	0.6285	↓	Bearish	Range	None	0.6283	0.6460
	USDSEK	10.1492	↔	No Signal	Range	None	9.9453	10.1949
EUR	USDNOK	9.7405	↔	No Signal	Transition	None	9.5628	9.8493
	EURGBP	0.8440	↓	No Signal	Range	None	0.8401	0.8442
	EURJPY	137.62	↔	No Signal	Transition	None	136.69	138.00
	EURAUD	1.4597	↓	Slightly Bullish	Range	None	1.4321	1.4866
	EURCHF	0.974	↓	Slightly Bullish	Downtrend	None	0.9700	1.0031
	EURCAD	1.3108	↓	No Signal	Transition	None	1.2968	1.3333
	EURNZD	1.6222	↓	No Signal	Transition	None	1.6064	1.6273
	EURSEK	10.3463	↓	No Signal	Downtrend	None	10.2619	10.3846
G10 Cross	EURNOK	9.9297	↓	No Signal	Downtrend	None	9.8917	10.0189
	AUDJPY	94.283	↑	Bullish	Range	None	93.82	96.88
	AUDNZD	1.1113	↑	Slightly Bearish	Range	None	1.1062	1.1197
	AUDCAD	0.8979	↔	No Signal	Range	None	0.8941	0.9035
	NOKSEK	1.0419	↔	No Signal	Range	None	1.0413	1.0467
	CADJPY	104.996	↑	No Signal	Transition	None	104.93	107.65
	GBPJPY	163.07	↔	No Signal	Range	None	162.98	164.28
	NZDJPY	84.83	↔	No Signal	Range	None	84.80	87.35
EM	GBPCHE	1.1541	↓	Slightly Bullish	Range	Lower	1.1525	1.1779
	USDMXN	20.2594	↔	No Signal	Range	None	20.1613	20.2633
	USDBRL	5.111	↔	No Signal	Transition	None	5.0327	5.1709
	USDZAR	16.6161	↑	No Signal	Transition	None	16.3524	17.3060
	EURPLN	4.6977	↑	No Signal	Range	None	4.6810	4.7043
	EURHUF	394.44	↔	No Signal	Range	None	390.12	399.33
	USDKRW	1306.34	↑	No Signal	Range	None	1293.95	1326.72
	USDINR	79.655	↑	Slightly Bearish	Uptrend	None	78.85	80.06
	USDCNH	6.7604	↑	Bullish	Transition	None	6.7221	6.8380

Data as of 08/08/22. Source: BofA Global Research, Bloomberg.

Positioning: uptrend has MAA > 60, downtrend MAA < 40. Positioning: uptrend reversal likely if MAA/UD/RS > 80, continuation likely if UD, RS < 50. Positioning: downtrend reversal likely if MAA/UD/RS < 20, and continuation likely if UD, RS > 50. UD and RS are 1y percentile and MAA is in %.

Positioning is bullish (green) if matrix shows downtrend reversal or uptrend continuation; Positioning is bearish (red) if matrix shows uptrend reversal or downtrend continuation.

Positioning is slightly bullish or slightly bearish (yellow) if only one of UD or RS supports the signal.

We use pair-wise comparison between spot, 5d, 10d, 20d, 30d, 50d, 100d, and 200d SMAs to construct the MAA indicator.

ADX: downtrend if ADX > 25 and DMI+ is below DMI-. ADX: uptrend if ADX > 25 and DMI+ is above DMI-. ADX shows Transition if ADX is between 20 and 25, and Range if ADX < 20. Cells in the ADX Trend column are colored with more intensity if the ADX trend signal matches the positioning signal. 14-day lookback is used for the ADX indicators.

The Bollinger Bands column shows 'Upper' if spot is above the +2 std Bollinger band, and 'Lower' if spot is below the -2 std band. 20-day SMA is used for Bollinger indicators.

Cells in Next Support and Next Resistance columns are colored if spot is within 0.5% of the support or resistance level.

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Trending and mean-reversion technical signals

In addition to MAA, UD, and RS, the technical analysts in the industry have also derived other indicators that we could use to support the positioning analysis signals. For the Technical Matrix, we employ the ADX (Average Directional Movement) and Bollinger Bands indicators. To learn more about a variety of technical strategies, please see Technicals Explained primer ([Get to know even more technical strategy, 24 January 2022](#)), as well as our Quantifying Technicals publications for the ADX ([Quantifying Technicals: 25 April 2022](#)) and Bollinger indicators ([Quantifying Technicals: 24 January 2022](#)).

Use ADX Trend in addition to the positioning trend

The ADX is determined by a secondary indicator called DMI (Directional Movement Index). The DMI consists of two lines: DMI Plus and DMI Minus. The DMI Plus line tends to move higher on rising prices, while the DMI Minus line tends to move higher on falling prices. When the DMI Plus crosses above the DMI Minus, the start of a new uptrend is

formed. In contrary, when the DMI Minus crosses above the DMI Plus, the start of a new downtrend is formed.

The ADX is a combination of the DMI lines and is used to define the path of prices as range bound or trending. Rising ADX indicates the current trend is gaining strength, while falling ADX indicates the current trend is weakening. When the ADX is below 20, the Technical Matrix ADX column would show “Range”, suggesting the pair does not have prominent trend. When the ADX is between 20 and 25, the Technical Matrix shows “Transition” (in grey), suggesting the pair may be transitioning between up and down trends. When the ADX is above 25, the Technical Matrix shows either “Uptrend” (in green) or “Downtrend” (in red) depending on whether DMI Plus is above or below DMI Minus. The “Uptrend” and “Downtrend” cells in this column would have more intense coloring if the ADX trend is in the same direction as the MAA trend (Positioning Trend column). As the ADX and DMI indicators in the Technical Matrix are calculated using 14-day open-high-low-close (OHLC) spot prices, the ADX trend may appear to be different at times with the trend determined by the longer-dated MAA, as the MAA positioning trend is determined by moving average crossings (through 200d SMA).

In our example on August 8, the ADX indicates EURUSD, USDJPY, EURCHF, EURSEK, and EURNOK were in downtrends in Exhibit 5, while USDINR was in an uptrend.

Use Bollinger Bands as another directional signal

The Bollinger Band consists of three lines: a moving average of price, two standard deviations above the moving average and two standard deviations below. For the Technical Matrix, we calculate Bollinger bands with a 20-day simple moving average. The bands often serve as an estimate of support and resistance levels. When markets are range bound, prices tend to trade between the bands. As a result, the Bollinger Bands column in the Technical Matrix shows “Lower” (in green) when the spot price is below the lower band and “Upper” (in red) when the spot price is above the upper band. However, it should be noted that when the bands are narrow relative to the past and prices break out through a band then a new trend and trade in the direction of the breakout is signaled. As a result, we would examine the Bollinger band in conjunction with the Bullish/Bearish signals from positioning analysis.

The sample Technical Matrix for August 8 shows GBPCHF spot price had breached below the lower Bollinger band, and the pair could bounce higher from a stretched level as positioning analysis also showed a “Slightly Bullish” signal (Exhibit 5).

Key levels to watch: Next Support and Next Resistance

Finally, the Technical Matrix uses 50d SMA, 100d SMA, 200d SMA, 1y high and low, 2y high and low, 1y 38.2%, 50%, and 61.8% Fibonacci retracement levels to determine the next support and resistance levels that investors should consider. Cells in these columns are colored in grey if the displayed spot price is within 0.5% from the next support and resistance levels.

Technical Matrix signals were bullish USD/CNH

Overall, for the sample data as of August 8, the highest conviction signal from the Technical matrix was bullish USD/CNH with positioning analysis showing an uptrend continuation signal for the pair.



CARS Signals

Earlier in 2022, we released the CARS (Cross-Asset Regime Switching) model ([FX Viewpoint: CARS model: weekly FX cross-asset drivers 22 June 2022](#)). It is a systematic model that makes weekly buy/sell decisions for G10 currencies based on cross-asset: equity, rates, and commodity factors.

Identify macro shock periods to weather volatility

The CARS model classifies each week as either normal or one with a “macro shock”. The model defines a “macro shock” as sharp declines in at least one of the following cross asset factors: equity returns, global yields or commodity prices. Conceptually, if the market expects an economic slowdown ahead, the equities fall as growth slows, yields fall as monetary policy becomes more dovish and commodity falls amid slower demand. The model assumes G10 FX behaves differently when there are macro shocks. The market is typically trend-following and accumulates long positions in normal times (also known as “risk-on”), which may be quickly unwound during a flight to quality or a “risk-off” episode during a macro shock.

Our macro-shock component not only gains from the “flight-to-quality” behavior exhibited during periods of systematic shocks, but also helps the model reduce the potential loss from retracement and volatility that tends to occur with systematic shocks as well.

Performance-based cross-asset factor selection for normal weeks

In normal weeks, ie, without a macro shock, the CARS model is designed to determine whether to prioritize the equity risk factor or the rates risk factor to trade G10 FX based on the 1y rolling performance of each. In addition, we introduce a commodity factor overlay to the equity vs rates factor selection process. The “normal week” cross-asset component improves upon our existing models by considering commodities as a driver for FX and assuming a dynamic relationship between FX and other asset classes over time.

Macro-shock weeks: signals bullish USD, JPY, CHF and bearish rest of G10 FX

Every week, the CARS model produces a dashboard showing the latest bullish/bearish signals for G10 FX and the cross-asset stylized statistics. Exhibit 6 shows an example of how the dashboard would look for a macro-shock week. The week of June 06, 2022 saw US equity market decline at a magnitude of -1.2 z-scores with declines in Swiss and New Zealand local equity markets, triggering a macro-shock signal. As a result, the model generated bullish JPY and CHF signals vs the USD, and bearish signals for the rest of the high-beta G10 FX vs the USD.

Exhibit 6: CARS weekly signals for macro-shock weeks

In this macro-shock week on June 6 2022, CARS was bullish USD, JPY and CHF due to equity shock

Currency	Bullish/Bearish	Equity Shock	Rates Shock	Global regime	z-score
EUR	Bearish	0.0	5.7	Commodity Shock	0.3
JPY	Bullish	0.4	-0.6	S&P 500	-1.2
GBP	Bearish	0.0	3.5	US Treasury	3.2
AUD	Bearish	-0.8	4.7		
CAD	Bearish	-0.8	4.9		
CHF	Bullish	-1.8	4.7		
NZD	Bearish	-1.1	0.1		
SEK	Bearish	-0.3	2.4		
NOK	Bearish	-0.1	1.8		

Source: BofA Global Research, Bloomberg. This “macro shock” example is from Monday, 06-June-2022.

Equity Shock column shows 5y z-score of 8-week equity return. Rate Shock column shows 5y z-score of 1-week change of 2y rate.

Commodity Shock refers to 1y z-score of 1-week BCOM Index return.

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Normal weeks: FX signals depend on cross-asset drivers

As macro-shock and normal weeks are mutually exclusive, a different dashboard shows signals for normal weeks. Exhibit 7 shows an example of how the dashboard would look



for a normal week. The week of July 18, 2022 was a normal week with the equity factor having a greater 1y rolling hit ratio than the rates factor hit ratio. As a result, CARS was bullish EUR and AUD vs the USD as the EU and Australia had the two highest equity returns over the previous week (Exhibit 8). To the contrary, the model was also bearish CAD vs the USD as the Canadian stock market had underperformed.

Exhibit 7: CARS was bullish EUR, AUD, bearish CAD vs the USD on equity factor rankings

CARS signals for equity regime week as of July 18 2022

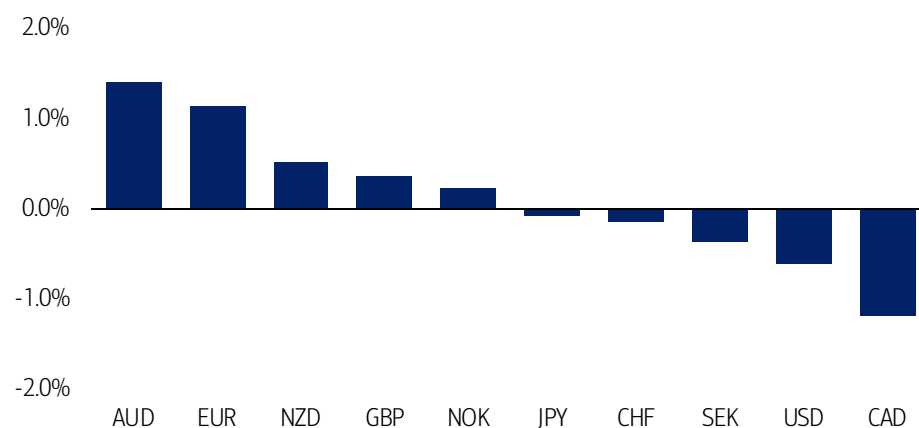
Currency	Bullish/Bearish	Equity	Rates	Commodity	Global regime	Values
EUR	Bullish	2	5	9	Commodity z-score	0.1
JPY		6	8	6	Performing factor	Equity
GBP		4	6	5		
AUD	Bullish	1	7	1		
CAD	Bearish	10	10	3	USD Equity	9
CHF		7	3	7	USD Rates	9
NZD		3	4	2		
SEK		8	1	8		
NOK		5	2	4		

Source: BofA Global Research, Bloomberg. Snapshot as of July 18 2022. The Equity ranking is ordered by 5y z-score of 1-week equity return. The Rates ranking is ordered by 5y z-score of 1-week 2y rate change. The Commodity ranking is ordered by 52-week FX correlation with BCOM. The Commodity z-score is the 1y z-score of 1-week BCOM Index return.

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Exhibit 8: AU and EU equity markets rallied the previous week

1-week equity return for G10 countries as of July 18 2022



Source: BofA Global Research, Bloomberg. Snapshot as of July 18 2022.

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CARS signals were bullish EUR

Overall, for the sample data as of July 18, the highest conviction signal from the CARS model was bullish EUR, AUD, and bearish CAD on the equity factor.



Interactive Time Zone

Breaking down currency performance by time zones can help investors better understand the sources of key flows. For example, private cross-border portfolio investment flows or reserve rebalancing related flows at any given time can be important drivers of FX movement. In addition, as FX is traded around the clock, understanding price action by currency and time zone can be useful for investors considering strategic hedges or expressing a directional view.

Split a 24-hour day to regional America, Europe, and Asia time zones

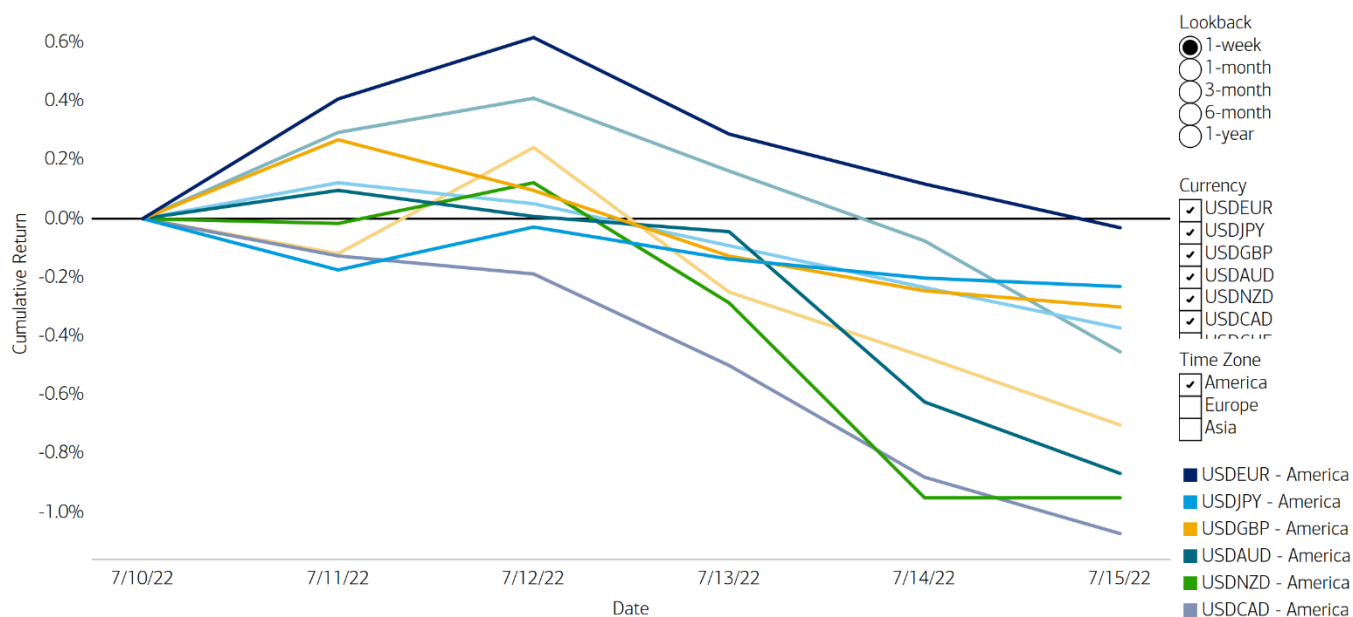
In our weekly FX Quant Insight report, we present an interactive Tableau dashboard that allows investors to examine currency cumulative returns vs the USD at different lookback periods, currency groupings, and time zones. Hours are shown in Coordinated Universal Time (UTC). We define America time zone as 1pm-12am UTC (9am-8pm EDT), Europe time zone as between 8am-1pm UTC (4am-9am EDT), and Asia time zone as between 12am to 8am UTC (8pm-4am EDT).

In this example as of Jul 18 2022, we find the America time zone has been driving the USD weakness in July (Exhibit 9). US-based investors turned into sellers of the USD since July 12, and the most USD supply occurred vs the CAD.

Expanding exhibits in the HTML view shows cumulative FX returns at different lookback periods, currency groupings, and time zones.

Exhibit 9: US-based investors started to broadly sell the USD after July 12

Interactive time zone plot as of July 18 2022. For readers of the web-formatted version of this report, access interactive features of the visualization by clicking on the image. Use the Google Chrome or Microsoft Edge browser for the best experience



We denote America time zone as between 1pm to 12am UTC, Europe time zone as between 8am to 1pm UTC, and Asia time zone as between 12am to 8am UTC.

Source: BofA Global Research

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A more granular breakdown splits a day into eight 3-hour ranges

We also present a heatmap that further breaks down a 24-hour day into eight 3-hour intervals (Exhibit 10). Using the heatmap for the sample week of July 18, we can identify periods of USD supply amid a broader backdrop of the USD uptrend. The more granular breakdown shows the USD supply has broadly occurred from 2pm to 5pm UTC (10am to 13pm ET) over the past week (Exhibit 10). During other times, particularly from 11pm to 2am UTC (7pm to 10pm ET), market dominated by Asia-based investors saw demand for the USD over the past week during this time.

Exhibit 10: Investors broadly sold USD during 2pm-5pm UTC (10am-13pm ET) the previous week

Cumulative price change by currency in granular 3-hour increments as of July 18 2022. For readers of the web-formatted version of this report, access interactive features of the visualization by clicking on the image. Use the Google Chrome or Microsoft Edge browser for the best experience

	8am-11am	11am-2pm	2pm-5pm	5pm-8pm	8pm-11pm	11pm-2am	2am-5am	5am-8am	Lookback
USDEUR	-0.5%	1.0%	-1.1%	0.4%	0.0%	1.3%	-0.1%	0.4%	<input checked="" type="radio"/> 1-week
USDJPY	-0.4%	0.6%	-0.5%	0.1%	0.2%	1.8%	0.4%	0.4%	<input type="radio"/> 1-month
USDGBP	0.1%	1.0%	-0.7%	-0.2%	0.3%	1.5%	0.0%	0.4%	<input type="radio"/> 3-month
USDAUD	0.4%	1.2%	-1.7%	0.1%	0.2%	1.1%	0.0%	0.5%	<input type="radio"/> 6-month
USDNZD	0.2%	1.1%	-1.6%	0.3%	0.1%	0.6%	0.1%	0.3%	<input type="radio"/> 1-year
USDCAD	0.5%	0.4%	-1.6%	0.1%	0.3%	1.1%	-0.1%	0.7%	
USDCHF	-0.1%	0.7%	-1.1%	0.2%	0.0%	0.3%	0.1%	-0.2%	
USDNOK	-1.1%	1.6%	-1.7%	0.4%	0.1%	0.8%	-0.1%	0.8%	
USDSEK	-0.8%	0.4%	-1.5%	0.5%	0.0%	0.2%	-0.1%	0.2%	

Hours are as of UTC. Currency pairs with greater loss over the lookback period are colored in darker red. Currency pairs with greater gain over the lookback period are colored in darker green. We denote America time zone as between 1pm to 12am UTC, Europe time zone as between 8am to 1pm UTC, and Asia time zone as between 12am to 8am UTC.

Source: BofA Global Research

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Time-zone insight pointed to US-hours USD supply

Overall, for the sample data as of July 18, the main time-zone insight was US-hours USD supply during 10am-1pm as market pessimism had peaked after US CPI print on July 13.

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