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Global Macro Strategy

Assessing FX Positioning with Currency Options

We introduce an updated way to estimate FX positioning using traded options data. For G10 and EM currency pairs, we create a positioning score (-100 to +100), aggregating for USD positioning. The data capture short-term leveraged traders so should be combined with longer-term positioning metrics.

- **How are investors positioned in USD?** We get this question frequently. The answer is not straightforward because it depends on the type of investor and time frame considered. Most market participants mean to ask about short-term positioning, which we think can be captured through FX options trading data.
- **Short-term investors hold short positions in USD currently, but the positions are not extreme.** We calculate positions in the broad USD at -19, on a scale of -100 to 100. **USD short positions are concentrated vs. G10 currencies,** with EM vs. USD positioning still broadly neutral (-6).
- **We rank individual currencies** on a scale of very short, short, neutral, long, and very long.
- Currently investors using options are **long most G10 currencies vs. USD, with NZD positioning flagging as very long.** In EM, investors are most **long PLN and TRY,** while **short IDR.**
- **Positioning as a trading signal:** Most G10 currencies reverse direction when positioning via options reaches an extreme, e.g., extreme short positioning --> stronger currency in the weeks ahead. The opposite occurs for CAD and EM FX, where positioning levels are better as a momentum indicator (as opposed to a contrarian one), particularly across higher-volatility EM currency pairs.
- **We use options trades as one of many inputs** to assess short-term FX positioning. Options offer an advantage over other positioning metrics because they are available daily and cover most liquid FX pairs. We will publish weekly updates in our regular FX positioning tracker report and, in the future, combine with other positioning metrics found in the futures markets, sentiment surveys, etc.

MORGAN STANLEY & CO. INTERNATIONAL PLC+

Sheena Shah
STRATEGIST
Sheena.Shah@morganstanley.com +44 20 7677-6457

John Kalamaras
STRATEGIST
John.Kalamaras@morganstanley.com +44 20 7677-2969

James K Lord
STRATEGIST
James.Lord@morganstanley.com +44 20 7677-3254

MORGAN STANLEY & CO. LLC

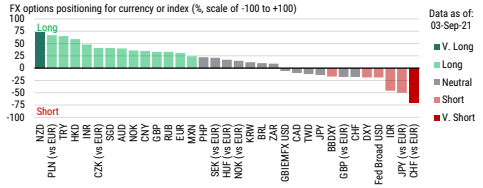
Andres Jaime
STRATEGIST
Andres.Jaime@morganstanley.com +1 212 296-5570

Matthew Hornbach
STRATEGIST
Matthew.Hornbach@morganstanley.com +1 212 761-1837

Exhibit 1: Broad USD options positioning

Source: DTCC, Bloomberg, Morgan Stanley Research; As of September 3, 2021.

Exhibit 2: Latest options positioning ranking (all currencies)



Source: DTCC, Bloomberg, Morgan Stanley Research; As of September 3, 2021.

Why care about FX positioning?

We are frequently asked for our assessment of market positioning for the US dollar and if there are any currencies where the market is positioned extremely long or short. A popular assumption is that if positioning is heavy in a particular direction, it may become harder for prices to continue to move in that same direction. Or if the positioning is high ahead of a risk event, that currency could be at risk of turning around abruptly if the outcome of the event is not as expected.

However, positioning is a difficult concept to define as for every buyer, there is a seller. What most people mean by "positioning" is short-term positioning for investment purposes, and often positioning that is leveraged and could change quite quickly should data, events and general news flow change market participants' views on where asset prices are heading. We focus on that short-term aspect for this report and analysis.

The options market provides a wealth of data that reveal how a specific segment of FX market participants believe currencies could trade in the future and if they are willing to pay a premium to position their currency exposure in line with that expectation. We first started including that information in our reports two years ago. Most importantly, data on options trades offer information about whether investors think prices will go up or down in the future, by comparing the types of options trades investors are implementing (calls versus puts). The data can be compiled to provide a measure of net positioning (long, short or neutral).

Finding a comprehensive set of FX positioning data is tough: The volume of FX spot trades is larger than options market trading volumes, but there isn't a widely available high-frequency dataset on FX spot positions, whether long or short. The CFTC publishes weekly positioning on net futures contracts outstanding and even breaks them down into the type of investor. However, these data are delayed by over a week and aren't available for all currencies (only the currencies with liquid futures instruments), unlike the options data we use in this report.

In the following sections, we describe how we derive the positioning score for each currency (scale of -100 to +100), how that score ranks versus its own history, and backtest to see whether extreme positioning can predict future FX performance.

We would suggest using the options positioning score as one input to a broader positioning assessment: Options data do not capture all positioning in the FX market, of course. Investor positioning in portfolio assets denominated in foreign currency is not captured in the options positioning score, for example. Investors in equities, bonds or other assets will likely have an underlying FX exposure. For example, a USD-based investor owning a German EUR-denominated company share. If the investor does not own an overlaying FX hedge, then they will also have a long EUR/USD position. This type of asset positioning is hard to assess on a global basis as FX hedge ratios are variable and often not published. Balance of payments and international investment position data could be used to gauge some element of positioning, which is used in some of our reports but not captured in this positioning score.

We include a range of different positioning and sentiment indicators in our weekly FX positioning tracker already. However, we present the data in a descriptive way and have not done any backtesting to see if meaningful investment signals can be generated by them. In future we plan to carry out some more rigorous analysis to test whether meaningful signals can be generated from them and, if so, present them alongside the results included in this report for a more comprehensive and meaningful set of FX positioning indicators.

Note: The performance data provided is a hypothetical illustration of mathematical principles, it does not predict or project the performance of an investment or investment strategy. Past performance is no guarantee of future results.

Contents

FX options positioning score

USD positioning

Every week we will generate a positioning score for USD and each major currency pair on a scale of -100 to +100. The scores for each individual currency pair can be aggregated with weights that reflect the Federal Reserve's Trade-Weighted Broad USD Index. A time series of that aggregated options-based USD positioning is shown in Exhibit 4 and indicates that the market is now short USD (-19) for the first time since June 2021.

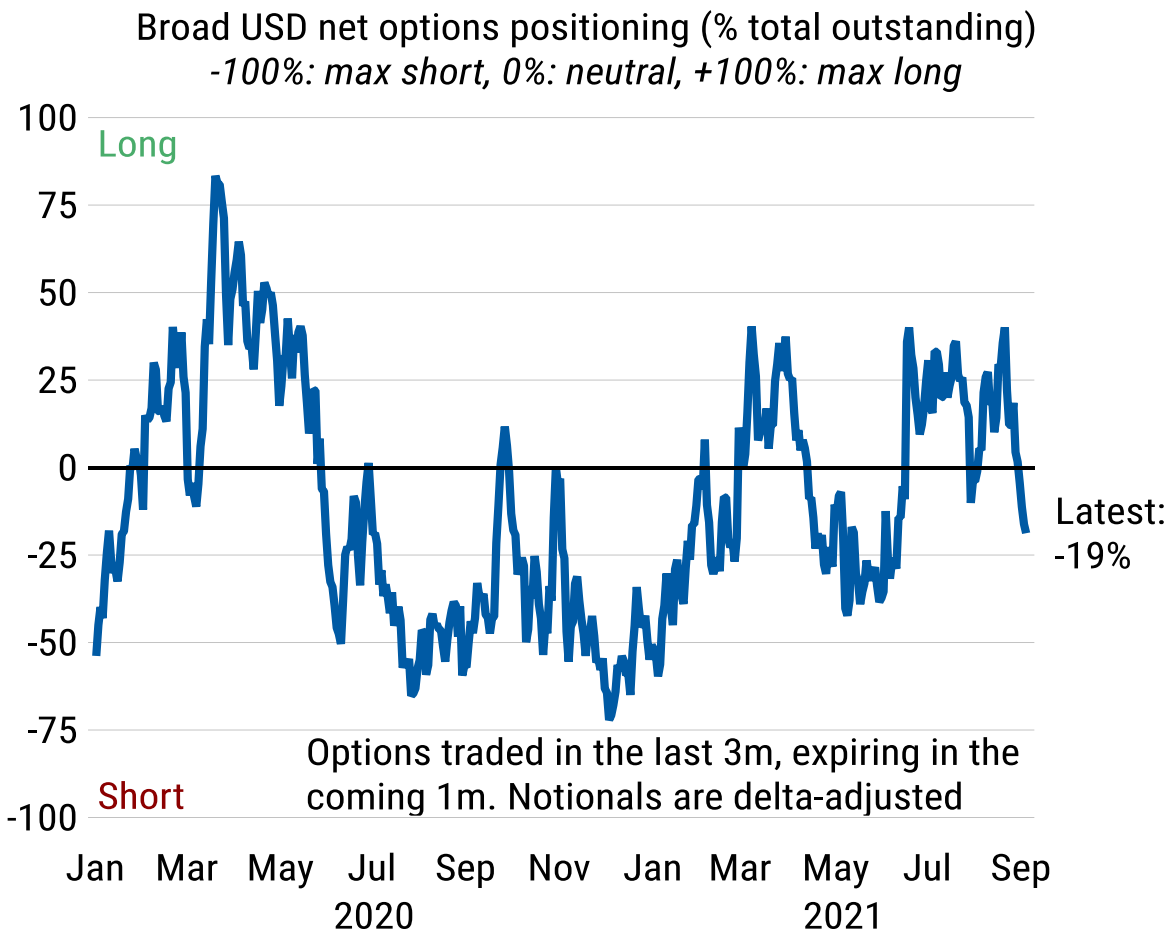
Some currencies may have been trending, which means investor positioning may have spent more time tilted in a bearish or bullish direction. To give some extra information on whether the market is very bearish (or bullish) currently, we compare current options positioning versus its own history. Exhibit 3 shows how we have classified the positioning into five categories, from very short to very long.

Exhibit 3: How to read our options positioning score

How to read the positioning tables		
Positioning score		
100	Market is max long	All calls, no puts
0	Market is neutral	Call notional = Put notional
-100	Market is max short	All puts, no calls
Positioning classification		
V. Long	Positioning > 1.5 standard deviations away from zero	
Long	…	
Neutral	Positioning within 1/2 standard deviation from zero	
Short	…	
V. Short	Positioning < 1.5 standard deviations away from zero	

Source: Morgan Stanley Research

Exhibit 4: Broad USD options positioning

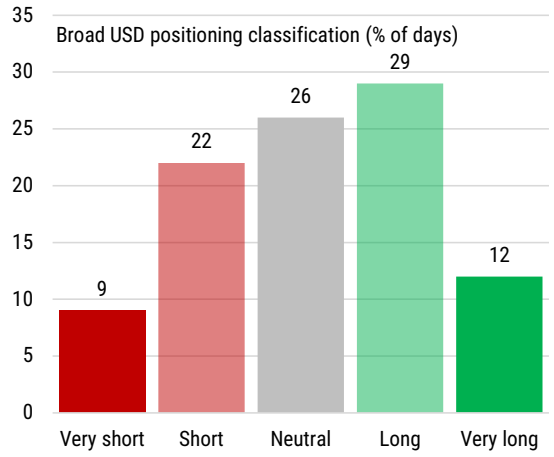


Source: DTCC, Bloomberg, Morgan Stanley Research; As of September 3, 2021.

Extreme levels of positioning, should by definition not occur too frequently. Each currency will spend a different amount of time in bullish- or bearish-positioning territory, depending on the direction the currency has been trending in. To make the positioning score more useful for each currency, we consider the level versus its own history. For example, "very long" positioning would be reflected by a score that is more than one-and-a-half standard deviations above zero.

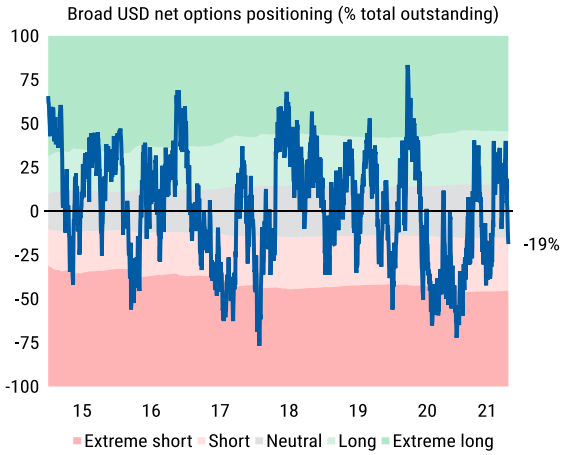
Exhibit 5 shows that USD positioning (on a broad index basis) naturally spends a lot of time at the neutral, long or short positions, with extreme long or short less frequent (Exhibit 6). For example, in the past six years, USD positioning has been classified as extreme long 12% of the time and extreme short 9% of the time. We have included similar statistics for how long each currency pair has spent in the positioning classifications in the Appendix (Exhibit 111).

Exhibit 5: How much time USD positioning spends in each classification



Source: Morgan Stanley Research; Note: For the classification, the standard deviation is calculated using an expanding (minimum of 1 year) window. Observations from beginning of 2015 are thus used.

Exhibit 6: How often has USD positioning been extreme?



Source: Morgan Stanley Research; Note: For the classification, the standard deviation is calculated using an expanding window

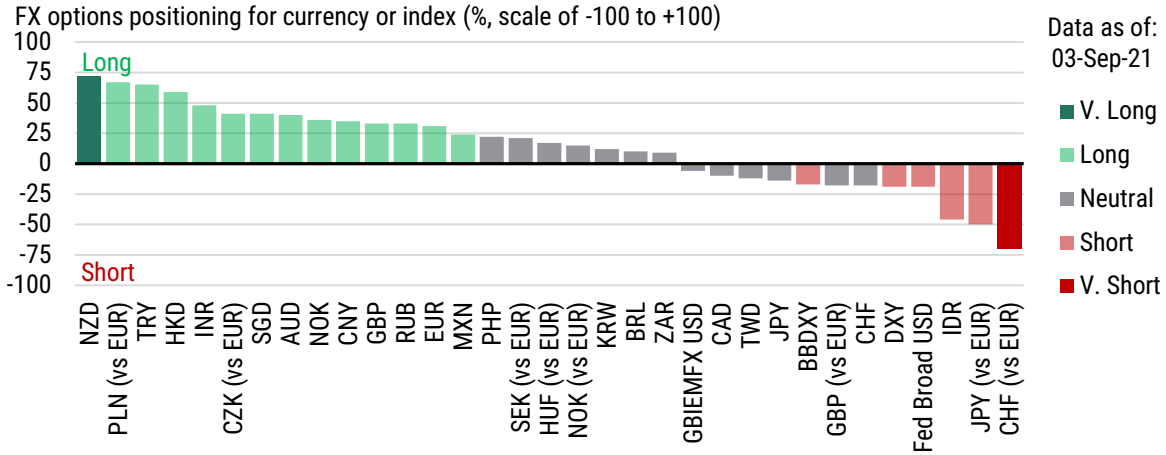
Positioning score for each G10 and EM currency

The chart and tables that we will publish regularly are shown in Exhibit 7, Exhibit 8, Exhibit 9 and Exhibit 10. Currencies are grouped by USD aggregates, G10 versus USD, G10 versus EUR, and EM regions (CEEMEA, AxJ and LatAm). Three columns show the currency, positioning classification (very short to very long) and positioning score (-100 to +100). All G10 and EM currencies are listed together in Exhibit 7 and Exhibit 10.

We would note that neutral is not always defined as just being at zero but also as being within half a standard deviation of zero. The individual positioning score is shown to identify how bullish or bearish the currency is on a net basis. EUR crosses are treated separately from USD crosses for major pairs such as EUR/GBP or EUR/JPY.

Time series charts of the options positioning score for each currency pair and index are shown in FX positioning history by currency.

Exhibit 7: Latest options positioning ranking (all currencies)



Source: DTCC, Bloomberg, Morgan Stanley Research; Note: Using options that were traded in the past three months and expire in the coming one month. Notionals are delta-adjusted. As of September 3, 2021.

Exhibit 8: G10 options positioning

USD Aggregates		
GBIEMFX USD	Neutral	-6
BBDXY	Short	-17
DXY	Short	-19
Fed Broad USD	Short	-19

G10 (vs USD)		
NZD	V. Long	72
AUD	Long	40
NOK	Long	36
GBP	Long	33
EUR	Long	31
CAD	Neutral	-10
JPY	Neutral	-14
CHF	Neutral	-18

G10 (vs EUR)		
SEK	Neutral	21
NOK	Neutral	15
GBP	Neutral	-18
JPY	Short	-50
CHF	V. Short	-70

Source: DTCC, Bloomberg, Morgan Stanley Research; Note: Using options that were traded in the past three months and expire in the coming one month. Notionals are delta-adjusted. As of September 3, 2021.

Exhibit 9: EM options positioning

CEEMEA		
PLN (vs EUR)	Long	67
TRY	Long	65
CZK (vs EUR)	Long	41
RUB	Long	33
HUF (vs EUR)	Neutral	17
ZAR	Neutral	9

AxJ		
HKD	Long	59
INR	Long	48
SGD	Long	41
CNY	Long	35
PHP	Neutral	22
KRW	Neutral	12
TWD	Neutral	-12
IDR	Short	-46

LatAm		
MXN	Long	24
BRL	Neutral	10

Source: DTCC, Bloomberg, Morgan Stanley Research; Note: Using options that were traded in the past three months and expire in the coming one month. Notionals are delta-adjusted. As of September 3, 2021.

Exhibit 10: Latest positioning snapshot

Data as of:	Positioning	03-Sep-21
NZD	V. Long	72
PLN (vs EUR)	Long	67
TRY	Long	65
HKD	Long	59
INR	Long	48
CZK (vs EUR)	Long	41
SGD	Long	41
AUD	Long	40
NOK	Long	36
CNY	Long	35
GBP	Long	33
RUB	Long	33
EUR	Long	31
MXN	Long	24
PHP	Neutral	22
SEK (vs EUR)	Neutral	21
HUF (vs EUR)	Neutral	17
NOK (vs EUR)	Neutral	15
KRW	Neutral	12
BRL	Neutral	10
ZAR	Neutral	9
GBIEMFX USD	Neutral	-6
CAD	Neutral	-10
TWD	Neutral	-12
JPY	Neutral	-14
BBDXY	Short	-17
GBP (vs EUR)	Neutral	-18
CHF	Neutral	-18
DXY	Short	-19
Fed Broad USD	Short	-19
IDR	Short	-46
JPY (vs EUR)	Short	-50
CHF (vs EUR)	V. Short	-70

↑ *Positioning is long* ↓

↑ *Positioning is short* ↓

Source: DTCC, Bloomberg, Morgan Stanley Research; Note: Using options that were traded in the past three months and expire in the coming one month. Notionals are delta-adjusted. As of September 3, 2021.

Options positioning calculation

The score

We use traded options data taken from the DTCC Global Trade Repository and follow the steps below to calculate the FX options positioning score.

1) **Get data on each FX option traded:** Every day, screen each FX options trade reported to the DTCC for vanilla options, classified as either calls or puts. Exclude exotic options trades which have a more complicated structure and therefore their directional exposure to the underlying FX pair cannot easily be identified. For EM currencies that are primarily traded in the NDF market, non-deliverable vanilla options are used instead. Data are available back to 2013/14 depending on the currency.

2) **Reduce the sample:** For every business day, the sample is reduced to include options traded in the past three months and are going to expire in the coming one month. This filters out longer-term hedging activity and puts more short-term positioning in focus. It also prevents reporting duplicates from artificially inflating the positioning score. At this stage, we have a total notional outstanding of call and put options that expire in the coming month, where the notional is denominated in the base currency.

3) **Weight the options positions (delta adjustments):** Call and put notionals of each individual trade are weighted, with a higher weight applied to option trades that are closer to being in the money relative to out of the money. We call it a delta adjustment. The weights change every day and for every options trade in the sample according to the market conditions (spot level and time to expiry) at the time. This creates a more accurate picture of the market's exposure to moves in the underlying currency pair.

4) **The positioning score:** The delta-adjusted call and put notionals are transformed into a positioning score as follows:

$$Positioning = \frac{Call\ notional - Put\ notional}{Call\ notional + Put\ notional} * 100$$

Positioning is thus classified as neutral (~0), long (>0) or short (<0), with +100 suggesting the options market is max long that currency pair and -100 suggesting the market is max short.

To account for the varying volatility of the different currencies, the positioning classification (long, short, etc.) is taking into account the underlying volatility in the positioning score, as outlined in more detail in Exhibit 3. An expanding window is used for the calculation of the standard deviation, so the thresholds for each positioning classification (very short, short, neutral, long, very long) would change over time. Due to the expanding nature of the window though, the moves are relatively small (see Exhibit 6 for USD positioning classifications over time).

Which currencies are included?

We started by considering currencies that our team covers and forecasts. Focus was predominantly on the USD crosses, given their high liquidity, but also the most frequently traded EUR crosses for the G10 and CEEMEA (as the reported trades for USD/CEEMEA crosses were very limited). A list of all currency crosses in our positioning universe is in Exhibit 11.

Some of these currency crosses that have reported data with the DTCC had an insufficient number of vanilla options trades reported every day. We excluded those pairs as a positioning score could not be accurately and consistently generated across time. The major excluded pairs are USD/CLP, USD/COP, USD/PEN in LatAm, USD/MYR and USD/THB in Asia and USD/SEK in the G10.

Exhibit 11: Options positioning: FX pair availability

G10		AxJ	LatAm	CEEMEA	USD Aggregates
EUR/USD	EUR/CHF	USD/CNY	USD/BRL	USD/ZAR	DXY
USD/JPY	EUR/SEK	USD/INR	USD/MXN	USD/TRY	Fed Broad USD
GBP/USD	EUR/NOK	USD/KRW	~~USD/CLP~~	USD/RUB	Bloomberg DXY
USD/CHF	EUR/GBP	USD/SGD	~~USD/COP~~	EUR/PLN	GBIEM-weighted USD
USD/CAD	EUR/JPY	USD/TWD	~~USD/PEN~~	EUR/HUF	
AUD/USD		USD/HKD		EUR/CZK	
NZD/USD		USD/IDR			
USD/NOK		USD/PHP			
~~USD/SEK~~		~~USD/MYR~~			
		~~USD/THB~~			

Source: Morgan Stanley Research; Note: Crossed-out currency crosses were excluded from the analysis due to limited trading volumes in the data set.

US dollar (USD) positioning calculation

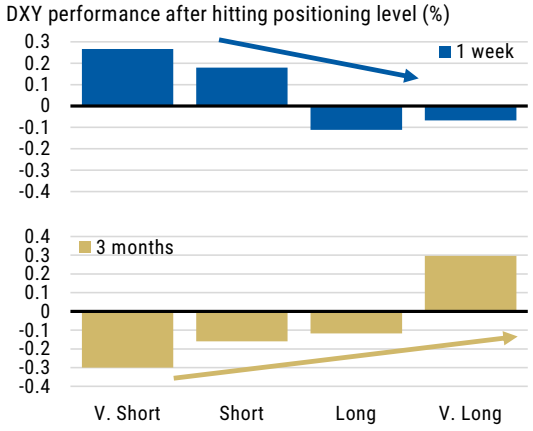
The positioning score of individual currency crosses are used to generate aggregated USD positioning estimates. Four common USD indices were considered: DXY, Fed's Broad USD, Bloomberg DXY USD and GBI-EM-weighted USD (the inverse of the GBI-EM-FX index). Some currencies in all these indices had insufficient options trading data, so were excluded. The weights of each USD index were adjusted to address the lack of positioning data for some currency crosses and are shown in the Appendix (USD aggregate index weights). A recent time series of the aggregated USD positioning indices is shown in the Appendix (USD Aggregates).

USD positioning

USD positioning has been falling from the peak seen on August 20 and has now turned short (on a broad basis) for the first time since early June, with a net positioning score of -19 out of 100 (Exhibit 1). Currently positioning is still far away from the extreme net short position of -72% seen at the start of December 2020.

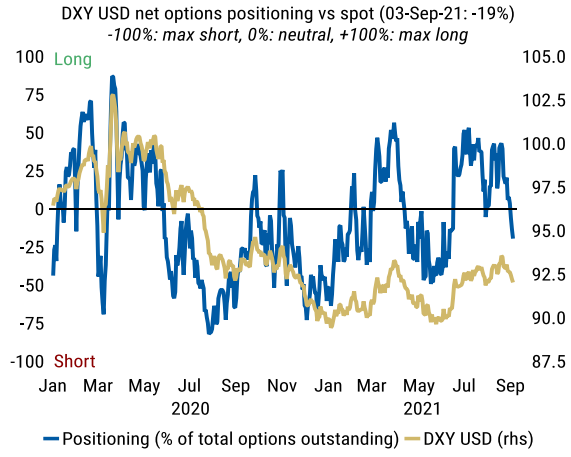
The positioning score is ranked relative to its own history, with very long or very short positioning occurring 20% of the time (Exhibit 5). We backtested to see if an extreme level of USD DXY positioning leads to a particular move in USD afterwards. Considering a variety of forward-looking periods, we have found that **USD options positioning is cyclical over several months**.

Exhibit 12: USD DXY average performance varies based on timeframe after hitting positioning level



Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 13: USD DXY net positioning score is cyclical – it moves from long to short to long again



Source: DTCC, Bloomberg, Morgan Stanley Research

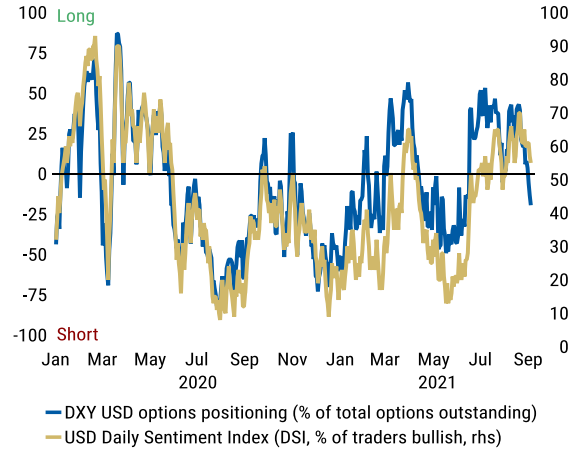
Exhibit 12 shows that the DXY USD index had rallied on average in the one week following very short or short positioning levels and weakened after hitting long positioning. **In the very near term, USD positioning provides a contrarian signal.**

The USD DXY positioning score since the start of 2020 (around the start of the pandemic) has reached very short and very long levels, with the cycles appearing to take only a few months (Exhibit 13). USD has weakened on average three months after hitting a very short extreme positioning level, while it has strengthened after hitting a very long extreme positioning level (Exhibit 12). Initially, those results would suggest that USD positioning provides a momentum-based signal for trading three months ahead; however, we think this is just an indication that **USD positioning cycles are relatively short.** For example, it may be that when "very short" positioning is hit, the price action may have resulted in closing of those short positions, the accumulation of long positions, and then potentially being sold again within that 3-month time horizon.

USD score versus other metrics

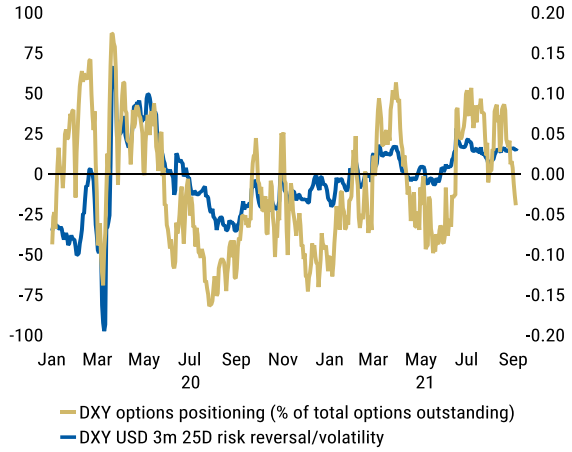
There are other inputs and data sets that should be used to estimate market positioning in a particular currency. In our regular reports we have been using indicators such as futures trader bullishness (Daily Sentiment Index, DSI), options market skew and CFTC positioning for futures contracts. The charts below show our options positioning score relative to some of these other positioning or sentiment data sets.

Exhibit 14: USD options positioning relative to futures trader sentiment (DSI)



Source: Trade-futures.com, Bloomberg, Morgan Stanley Research

Exhibit 15: USD options positioning relative to options skew



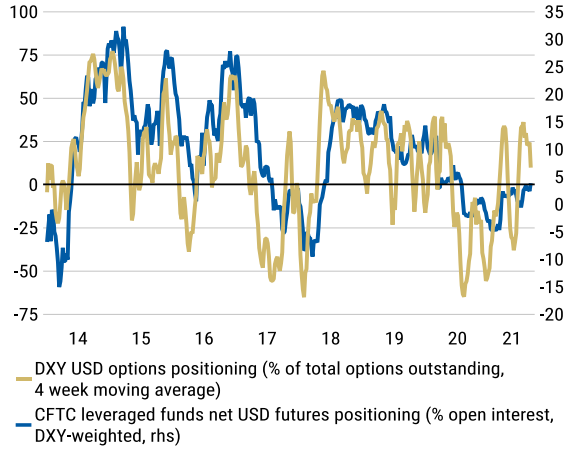
Source: Bloomberg, Macrobond, Morgan Stanley Research

We find that the USD options positioning score has tracked the shorter-term metrics more closely than longer-term metrics of positioning. Exhibit 14 shows that has the options score has tracked futures trader sentiment (DSI) quite well since the start of 2020. Similarly, the general trends of futures CFTC positioning for leveraged traders track the up and down cycles of the options positioning score (Exhibit 16).

As we use options market data as the main input, we would expect options sentiment to track the positioning score. Exhibit 15 shows that USD DXY 3m options skew has tracked the general trends of the options positioning score but can have days or short periods of divergence. Considering the relationship between options positioning and skew over the past year, the current level of short USD positioning has diverged from the positive/bullish skew currently priced into options markets.

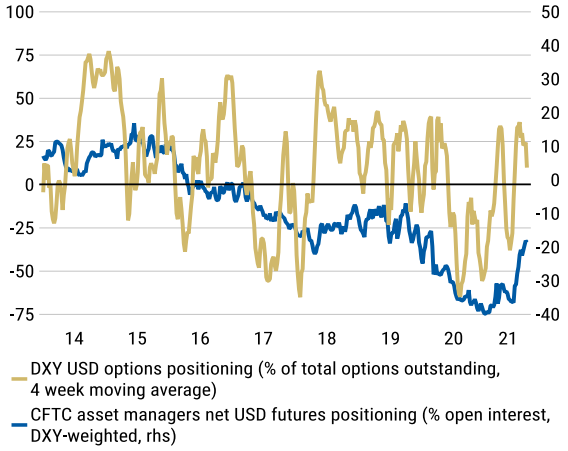
Asset manager positioning in the USD DXY via futures has been net short since 2016 despite periods of bullish and bearish USD price movements. Exhibit 17 shows that there is little relationship between our USD options positioning score and asset manager positioning via futures. We think this may be because the options score is capturing shorter-term market positioning that is likely to be more volatile.

Exhibit 16: USD options positioning relative to futures CFTC leveraged fund positioning



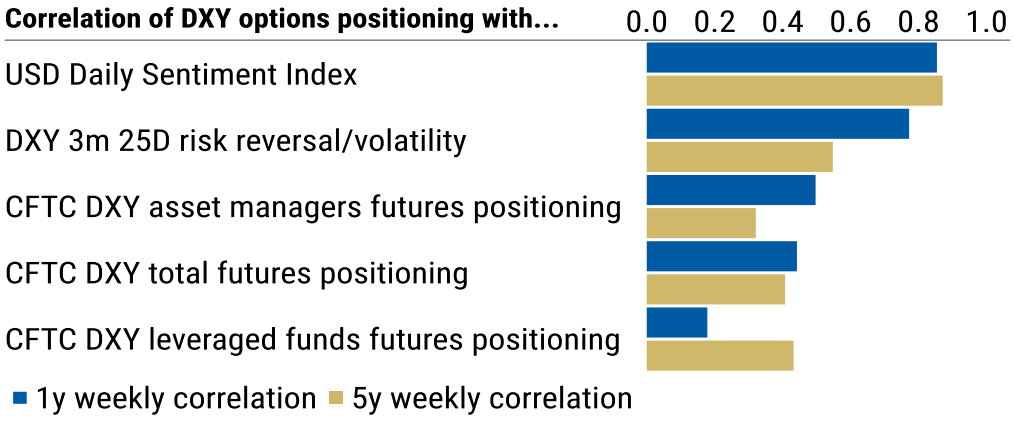
Source: Bloomberg, Macrobond, Morgan Stanley Research

Exhibit 17: USD options positioning relative to futures CFTC asset manager positioning



Source: Bloomberg, Macrobond, Morgan Stanley Research

Exhibit 18: USD options positioning correlation to other positioning metrics



Source: Trade-futures.com, Bloomberg, Macrobond, Morgan Stanley Research

Trading signals from FX positioning

Positioning is often treated as a contrarian signal by the market, where extreme long/short positioning means poor/better forward returns, respectively. This makes sense intuitively as overly stretched positioning makes an asset vulnerable to a turn in prices. Investor sentiment also pushes asset prices away from the equilibrium level justified by underlying fundamentals over short-term time horizons, making mean-reversion strategies appealing when positioning has moved disproportionately in one direction.

With this in mind, we first assess the usefulness of our short-term FX options positioning score as a contrarian indicator in the short term (one week). We do so by backtesting two simple contrarian strategies: one that includes all currency crosses in G10 or EM separately and one that considers each currency pair in isolation.

We then focus on the positioning classification (very short, short, long and very long), as outlined in Exhibit 3 and featured in the main positioning tables in FX options positioning score, and look at forward returns across different time horizons (ranging from one week to three months).

Key results

Short term (one week after positioning signal)

In the G10, contrarian strategies utilizing options positioning provide attractive risk-adjusted returns over our backtest period, with a Sharpe ratio of around 0.5 since early 2015. Options positioning is contrarian for most G10 currency crosses, with USD/CAD standing out as an exception. This is perhaps due to CAD's frequent use as a hedge among EM investors given both its high commodity sensitivity and its higher liquidity.

In EM, short-term contrarian strategies instead underperform, particularly on crosses with higher volatility such as USD/TRY and USD/RUB. In fact, options positioning in EMFX is more useful as a momentum – as opposed to contrarian – indicator on the one-week time horizon for the majority of currencies.

Long term (three months)

The contrarian nature of options positioning becomes clearer over a longer time horizon (three months). That is the case on average for both the G10 (Exhibit 35) and EM (Exhibit 37), although individual currency performance does vary. More information on individual currency performance across different time horizons can be found in the Appendix in FX options positioning backtest: More details.

Looking across the different time horizons and currencies, options positioning works most consistently as a *contrarian indicator* for GBP, JPY, CHF, SEK and NOK in the G10 and ZAR, HUF, TWD, IDR in EM. It works most consistently as a *momentum indicator* for CNY and PHP.

How we backtested

For the one-week backtesting, we use weekly data from the beginning of 2015 and the 1-year percentile of our options positioning score outlined in Options positioning calculation. This better reflects the short-term nature of the positioning score by comparing the latest value only to recent history and identifying periods when positioning moved disproportionately in one direction. Each of the portfolios are constructed using equal weights and rebalanced weekly every Monday morning, based on the latest available positioning snapshot as of end-Friday.

Spot – as opposed to total – returns are deliberately used as part of the strategy simulation in order to assess the effectiveness of options positioning at judging turning points in spot price action, irrespective of the carry profile of the different FX crosses. The universes for each of the strategies are defined as per Exhibit 11, with EMFX represented by the combination of the AxJ, CEEMEA and LatAm regions.

We then focus on the performance of the positioning classification (very short, short, etc.) and also expand the analysis to consider longer time horizons that are perhaps more suited for fundamental investors. Weekly data are again used to filter the day-to-day noise, and median (rather than mean) returns are calculated to prevent high-volatility events (such as the market reaction to the coronavirus in March 2020) from skewing the results.

In the sections that follow, we discuss our methodology and findings in more detail.

G10 FX options positioning: A contrarian indicator

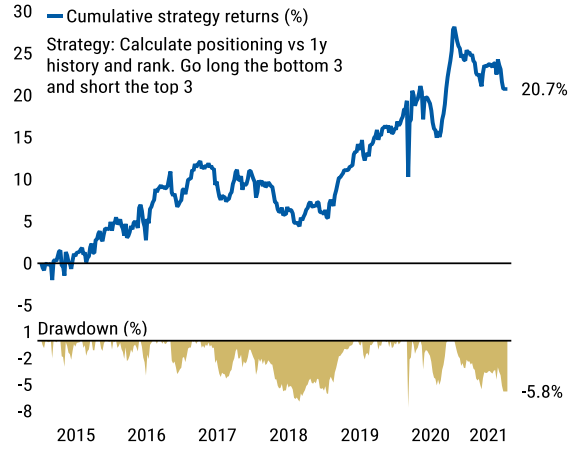
G10 FX strategy (all currencies)

The first strategy we consider includes all G10 FX pairs (versus both USD and EUR). At the beginning of each week, the strategy compares the latest options positioning value for each G10 FX pair (as of Friday close) relative to its 1-year history and calculates the 1-year percentile. It then ranks the different crosses from lowest to highest based on that percentile.

This is a relative – as opposed to absolute – comparison of positioning across the G10 currency pair group. A currency cross being placed at the bottom of the relative ranking does not necessarily mean the options market is short that pair. It just suggests that options market participants are least constructive on that pair versus what has been the case on average over the past year (short, neutral or long).

The strategy then takes long positions in the three currency crosses that rank the lowest and short positions in the three currency crosses that rank the highest across the G10 universe. It holds those positions for the duration of the week, before rebalancing again ahead of Monday morning. The cumulative returns and key performance statistics[1] of such a weekly strategy are shown in Exhibit 19 and Exhibit 20.

Exhibit 19: G10 FX all currency strategy performance



Source: Morgan Stanley Research

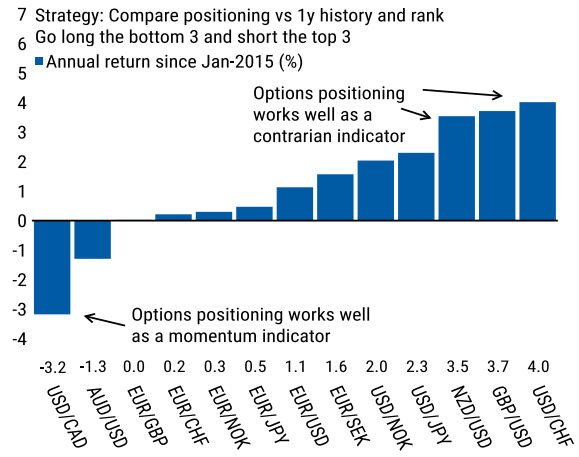
Exhibit 20: Performance statistics (G10 FX all currency strategy)

Start date	11-Jan-15
End date	01-Aug-21
	Backtest
Cumulative returns	20.7%
Annual return	2.9%
Annual volatility	6.6%
Sharpe ratio	0.47
Calmar ratio	0.38
Stability	0.80
Max drawdown	-7.6%
Omega ratio	1.22
Sortino ratio	0.68
Skew	-0.85
Tail ratio	1.10

Source: Morgan Stanley Research

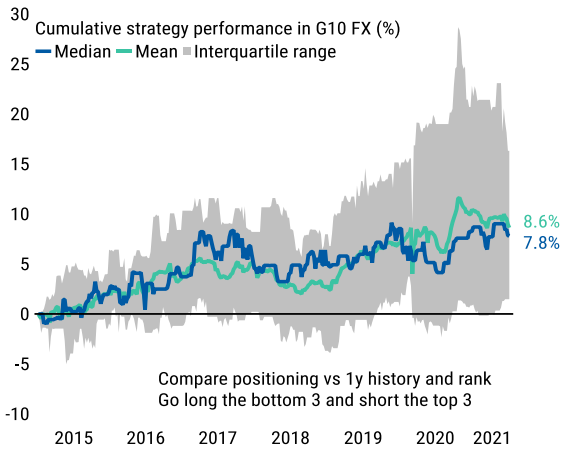
Overall, the G10 FX strategy based on positioning has largely generated positive excess returns with a Sharpe ratio of 0.47 since 2015, despite exhibiting some cyclicality with periods of underperformance in 2018 and 2021 to date. Reducing the number of trades initiated every week from the current number of six (three short positions + three long positions) to a total of four or two also monotonically increases the Sharpe ratio of the strategy to a high of 0.71 (using one short and one long position) as well as the skew of the returns distribution to 0.58 (Exhibit 25). This suggests there is **incremental information content where G10 options positioning is most extreme.**

Exhibit 21: Individual currency pair performance



Source: Morgan Stanley Research; Note: Using spot returns and excluding transaction costs.

Exhibit 22: Mean and median performance



Source: Morgan Stanley Research; Note: Using spot returns and excluding transaction costs.

- Looking at the performance across the different pairs, the strategy also delivers positive returns on average and across most (>75%) of the currency universe considered (Exhibit 22).

- In terms of individual currency pairs (Exhibit 21), the strategy works best for USD/CHF and GBP/USD, while USD/CAD flags as the only G10 currency pair where the strategy underperforms significantly.

- The G10 currency strategy appears to be optically tracking the moves in the

broader USD index (Exhibit 23) but the correlation between the two has varied during most of the backtesting period and is currently very close to zero.

Exhibit 23: The correlation of the G10 all currency strategy with Broad USD is low

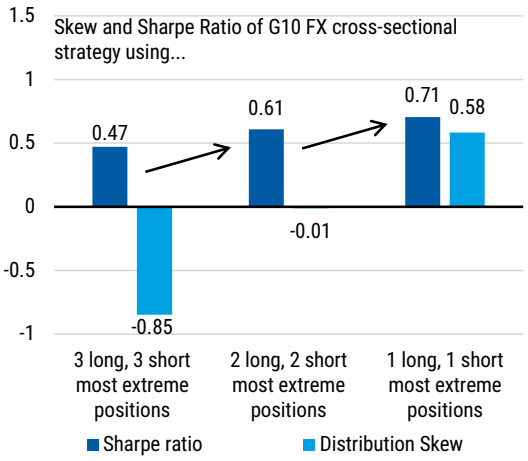
Source: Bloomberg, Morgan Stanley Research

Exhibit 24: G10 FX all currency strategy performance by year

Year	Return	Volatility	Sharpe ratio
2015	4.0	6.2	0.7
2016	3.2	6.4	0.5
2017	3.0	4.3	0.7
2018	-4.0	4.0	-1.0
2019	8.9	4.3	2.1
2020	7.5	11.7	0.6
2021	-2.8	4.6	-0.6

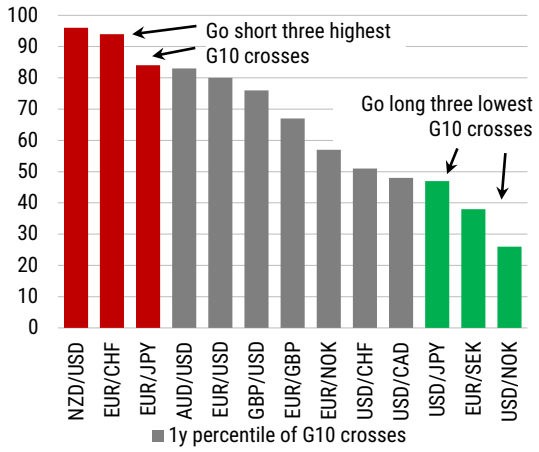
Source: Morgan Stanley Research; Note: 2021 refers to year-to-date values.

Exhibit 25: Focusing where G10 FX positioning is most extreme increases the performance of the strategy



Source: Morgan Stanley Research; Note: Using spot returns and excluding transaction costs.

Exhibit 26: Latest G10 strategy signals



Source: Morgan Stanley Research; As of September 3, 2021.

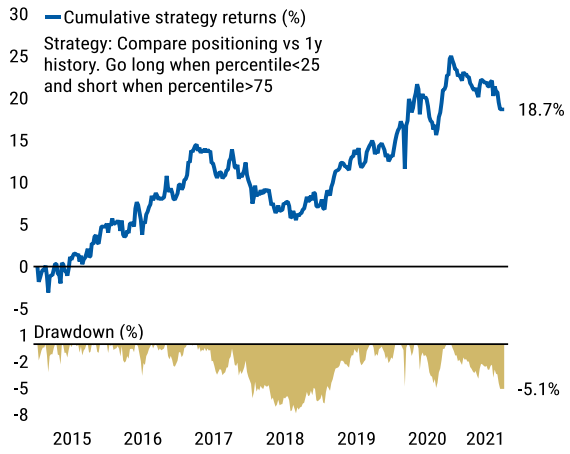
G10 FX individual-currency strategies

The second strategy tested whether for an individual G10 currency, its own extreme positioning would result in a turnaround in currency performance. We could call it a contrarian time series strategy. The strategy construction is similar to the one described in the G10 FX strategy (all currencies) section above, in that a 1-year percentile score is used rather than the absolute positioning score itself.

The key difference is that the individual-currency strategy goes short (long) any currency pairs in the top (bottom) 25th percentile, respectively. Positions are taken in any currency pairs where positioning flags as extreme relative to its own history – not relative to the rest of the currency universe. The all-currency strategy only allowed a specific number of open positions every week (three short and three long), while the

individual-currency strategy can have one position per currency pair considered.

Exhibit 27: G10 FX individual-currency strategy performance



Source: Morgan Stanley Research; Note: Using spot returns and excluding transaction costs.

Exhibit 28: Performance statistics (G10 FX individual-currency strategy)

Start date	11-Jan-15
End date	01-Aug-21
	Backtest
Cumulative returns	18.7%
Annual return	2.6%
Annual volatility	5.6%
Sharpe ratio	0.49
Calmar ratio	0.33
Stability	0.79
Max drawdown	-7.9%
Omega ratio	1.21
Sortino ratio	0.73
Skew	0.07
Tail ratio	1.00

Source: Morgan Stanley Research

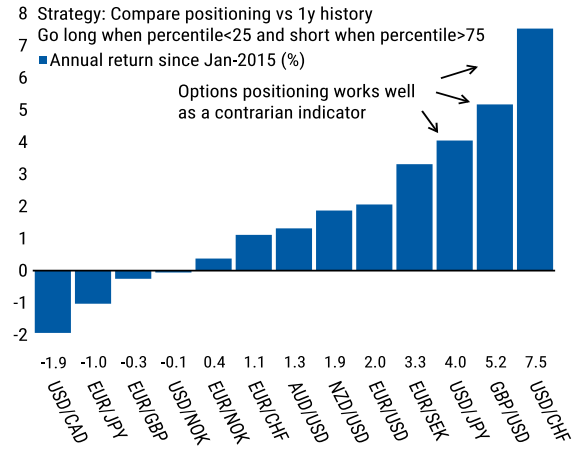
Considering currency positioning rankings individually doesn't appear to alter the results of their effectiveness as trading signals. The individual currency positioning backtesting suggests slightly lower annual returns relative to the all-currency strategy. As the portfolio had low returns similar to those of the other strategy, there was a similar Sharpe ratio of 0.49 (Exhibit 28). Many of the key takeaways from the G10 FX all-currency portfolio also carry over to this strategy.

Both strategies suggest that options positioning works well as a contrarian indicator for most G10 FX pairs, with USD/CHF and GBP/USD in particular standing out.

USD/CAD appears to be an exception as it is the only USD/G10 cross where the options positioning indicator works better as a momentum rather than contrarian indicator when it reaches extreme high or extreme low levels. We think this may be because commodity G10 currencies such as USD/CAD and AUD/USD have been frequently used by EM investors for hedging due to their higher liquidity and higher commodity sensitivity. So the outcome of USD/CAD options positioning as a trading signal is similar to the way many EM currencies behave relative to positioning indications, i.e., as momentum indicators.

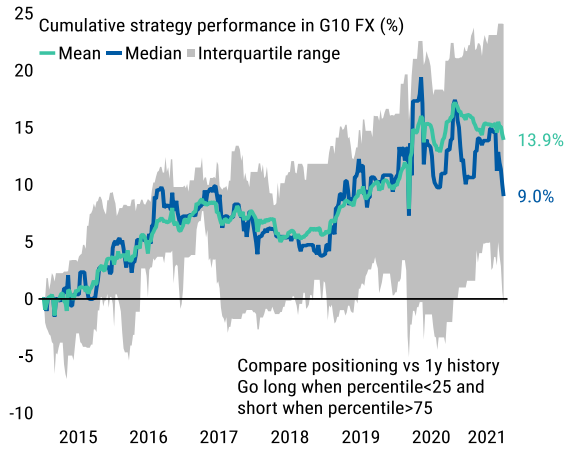
We would note that the different results for USD/CAD are not related to the quality of the data set, as the pair has one of the highest trading volumes in the data set, both in absolute (number of vanilla options trades recorded per day) and relative (proportion of options trading volume covered by the data set; Exhibit 39Exhibit 39) terms.

Exhibit 29: Individual currency performance



Source: Morgan Stanley Research; Note: Using spot returns and excluding transaction costs.

Exhibit 30: Mean and median performance



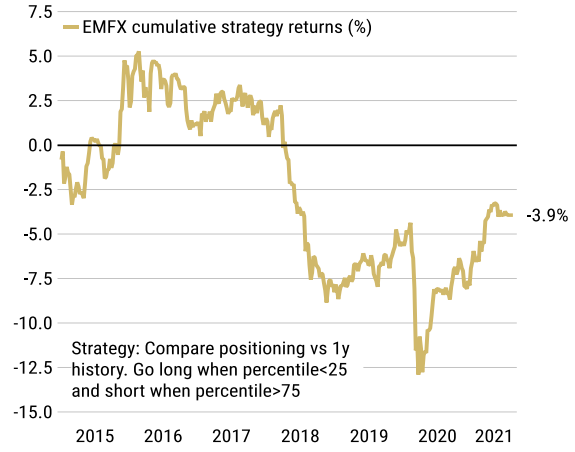
Source: Morgan Stanley Research; Note: Using spot returns and excluding transaction costs.

EM FX options positioning: More of a momentum indicator

For EM currency pairs considered (Exhibit 11), we ran similar backtests to what was described in the G10 section above – ranking a basket of EM currency positioning relative to each other and considering each EM currency individually versus its positioning history. Focusing on the individual EM currency positioning, we find one key difference from the outcome of the G10 strategies.

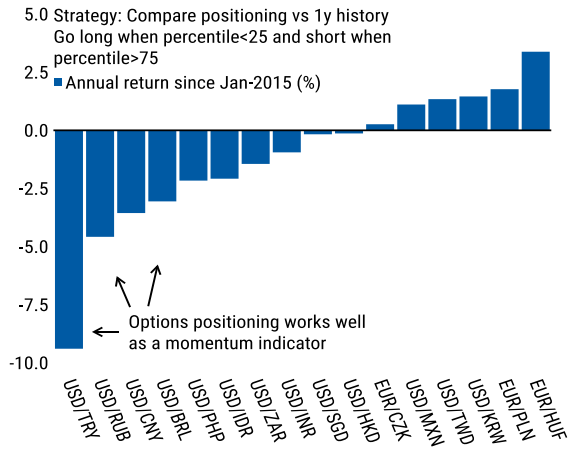
EM FX options positioning performs best as a momentum – as opposed to contrarian – signal for many EM currencies on the 1-week forward time horizon, particularly among high-yielding crosses such as USD/TRY and USD/RUB. That is, extreme lower-than-average positioning in the options market has on average led to further weakness in the week ahead (Exhibit 32).

Exhibit 31: Options positioning more of a momentum rather than contrarian indicator in EM in the short term...



Source: Morgan Stanley Research; Note: Using spot returns and excluding transaction costs.

Exhibit 32: ...particularly among higher-volatility EM crosses



Source: Morgan Stanley Research; Note: Using spot returns and excluding transaction costs.

The general difference between the trading signal interpretation for EM (momentum) versus G10 currencies (contrarian) is not a result of the lower liquidity or data

availability for EM FX. Options positioning has been working better as a momentum indicator even in pairs with relative higher coverage in our data set, such as USD/RUB, USD/CNY and USD/BRL (Exhibit 39). This is a similar result to USD/CAD, which is the cross with the largest coverage in the DTCC data set and also works better as a momentum rather than contrarian indicator.

However, FX options volumes are generally smaller than in the spot or forward/NDF markets and that can be exacerbated by the overall lower liquidity of some EM currencies (see Size of the FX options market). Our LatAm colleagues have found that other metrics using spot or NDF markets provide a more useful indication of positioning in the region relative to the options market, partly due to the larger volume of trades reported in those markets. In future publications we are planning on expanding the universe of those metrics in order to complement the signals obtained from FX options positioning.

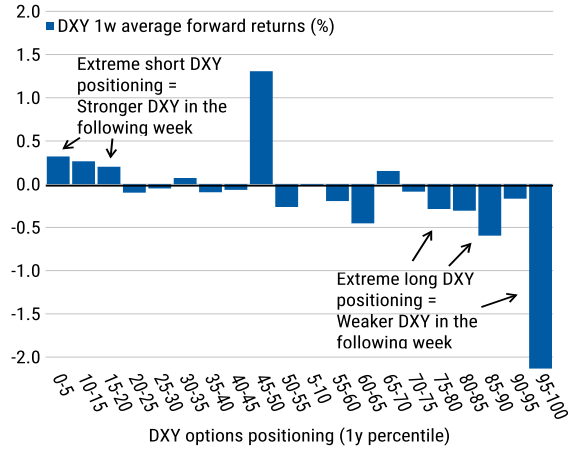
Overall USD positioning

Options positioning working better as a contrarian indicator for G10 currencies but as a momentum indicator for most of EM currencies over a one-week time horizon has implications for broader USD positioning. This is due to the different weights each USD index assigns to the two regions.

As expected, the DXY USD positioning index works well as a contrarian indicator in the following week, when positioning reaches both extreme high and extreme low levels (Exhibit 33), given it fully comprises G10 currency crosses (Exhibit 116). For more details, see USD positioning.

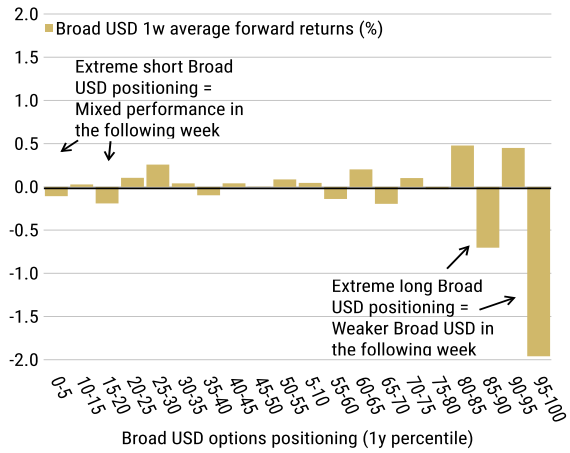
For the Fed's Broad USD index, which includes EM and G10 currencies, a contrarian strategy as outlined in the sections above would have resulted in negative performance since 2015, particularly in the period between 2016 and mid-2018. This can be explained by the relatively high weight of EM currency crosses in the index (Exhibit 6). Even so, there is still value in looking at extreme high or long Broad USD positioning readings as potential turning points in price action, as shown in Exhibit 34.

Exhibit 33: Options positioning works well as a contrarian indicator for the USD DXY index in the short term



Source: Morgan Stanley Research

Exhibit 34: Options positioning works well as a contrarian indicator for Broad USD only when it reaches extreme high levels



Source: Morgan Stanley Research

Predicting FX over longer time horizons

In this section, we expand the analysis to consider longer time horizons (one month and three months) that are perhaps more suited for fundamental investors.

Having looked at the performance of FX options positioning on a short-term time frame (one week) and using a 1y percentile (as opposed to the raw score), we now focus on the performance of the positioning classification (very short, short, etc.) as outlined in Exhibit 3 and featured in the main positioning tables in FX options positioning score. Weekly data are again used to filter the day-to-day noise, and median (rather than mean) returns are calculated to prevent one-off extreme market events from skewing the results.

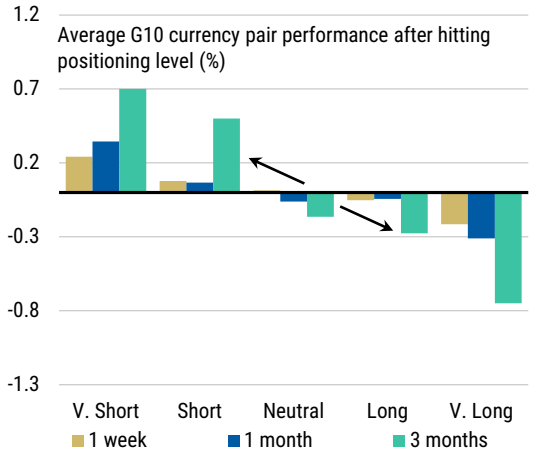
We find that on average across the different G10 currency crosses, **options positioning works well as a contrarian indicator in the G10 regardless of the forward-looking time period considered:** Positioning being classified as "short" or "very short" results in positive forward returns on average for the different G10 crosses, and vice versa for the "long" and "very long" classifications (Exhibit 35). Returns are bigger at the extremes ("very short"/"very long") and the magnitude of the moves is also larger when looking at longer time horizons (one or three months).

For the DXY USD index in particular, options positioning is a contrarian indicator in the one-week time frame (Exhibit 36), confirming the results of the two trading strategies described above. Performance is more mixed when looking at longer time periods though, largely due to the mixed performance of EUR/USD and USD/CAD in those periods.

EM FX options positioning does not work well as a contrarian indicator in the short term (one week to one month) but is contrarian when we consider a longer time horizon (Exhibit 37). The conclusion is also similar if we look at aggregated GBI-EM-weighted USD positioning instead (Exhibit 38).

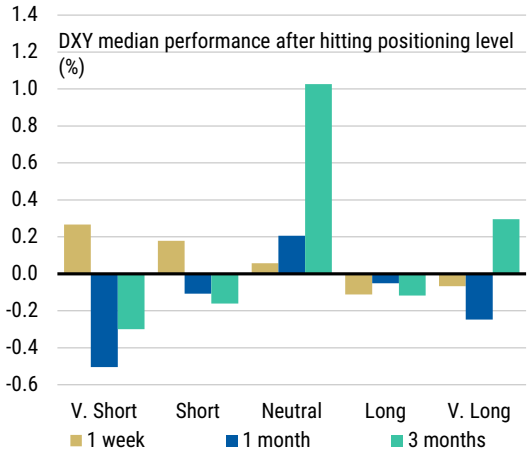
Results for individual currency crosses can be found in the Appendix in FX options positioning backtest: More details.

Exhibit 35: Options positioning a contrarian indicator on average across the G10 regardless of the time period considered



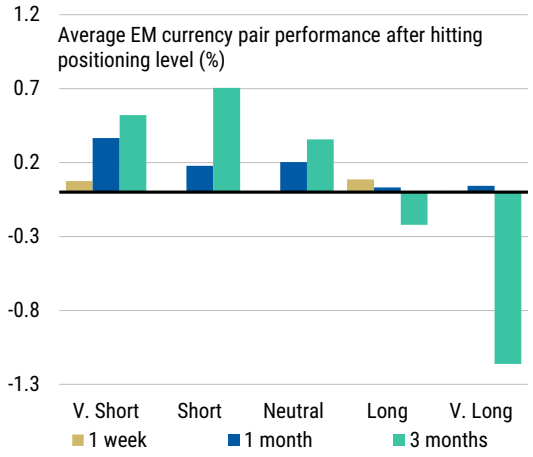
Source: Morgan Stanley Research; Note: Using spot returns and data from 2015.

Exhibit 36: Options positioning is a contrarian indicator for DXY on the one-week horizon but afterwards performance is mixed



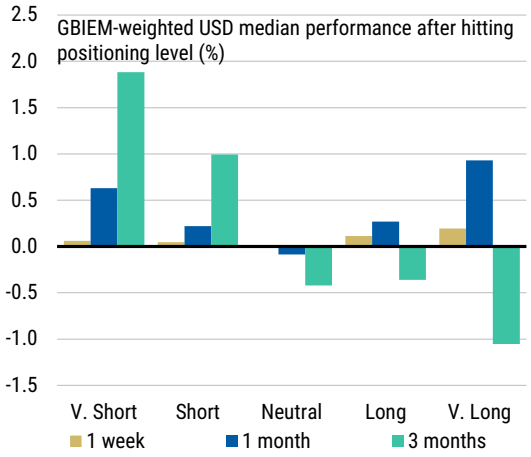
Source: Morgan Stanley Research; Note: Using spot returns and data from 2015.

Exhibit 37: Options positioning is a contrarian indicator for EMFX over a 3-month time horizon



Source: Morgan Stanley Research; Note: Using spot returns and data from 2015.

Exhibit 38: Long GBI-EM-weighted USD positioning results in negative 3-month returns and vice versa



Source: Morgan Stanley Research; Note: Using spot returns and data from 2015.

FX positioning: Broader measures

Limitations of using FX options

Measuring and estimating market positioning is difficult. We have used options data because they are updated every day and available for a wide variety of currencies. Using options markets to estimate positioning isn't perfect and comes with its own set of limitations. This is why we think it is best to combine the options positioning metric with other measures to create a more complete assessment of FX positioning.

First, options positioning naturally only considers the options market, which by itself does not always paint an accurate picture of the overall positioning in the FX market. Options markets for different currencies vary in depth and are also used not just for market investment purposes but also for other activities, such as hedging. In creating the options positioning score, we reduced the sample used for the daily calculation to options traded in the past three months that expire in the coming one month (see FX options positioning score).

While this does filter out longer-term hedging activities and puts the focus more on market investment positioning, it also reduces the time horizon of the trades captured to a maximum of four months. FX investors with longer time horizons that decide to express a view via the options market will thus not be captured by our positioning score.

Similarly, it is not just FX investors that have exposure to the FX market. A USD-based equity investor that owns a German EUR-denominated company share for example is also indirectly long EUR/USD if that investor does not own an overlaying FX hedge. Positioning in the spot or forwards market is not captured by our options positioning indicator and is more generally hard to assess on a global basis. Balance of payments and international investment position data do provide a gauge of positioning across countries and regions, but updates of such data are very infrequent (monthly or quarterly).

There are also technical limitations related to the data set itself:

1) **Lifetime of the individual option contract cannot be tracked:** This is the main limitation of the data set in our view. The trader information (buy/sell) of each options trade is not disclosed with the data. That can lead to one options trade being recorded multiple times as the position changes hands over time. A dealer, for example, may decide to off-load part of their option book via an interdealer broker and that would again be recorded as a separate transaction, thereby artificially inflating the positioning metric.

The relatively short time horizon we consider in our calculation (options that were traded in the past three months and expire in the coming one month) is aimed at mitigating such multiple counting. It is inherently difficult to account for and remove such duplicated transactions though, given that other reported information of each trade (such as premium or perhaps strike) will be different each time.

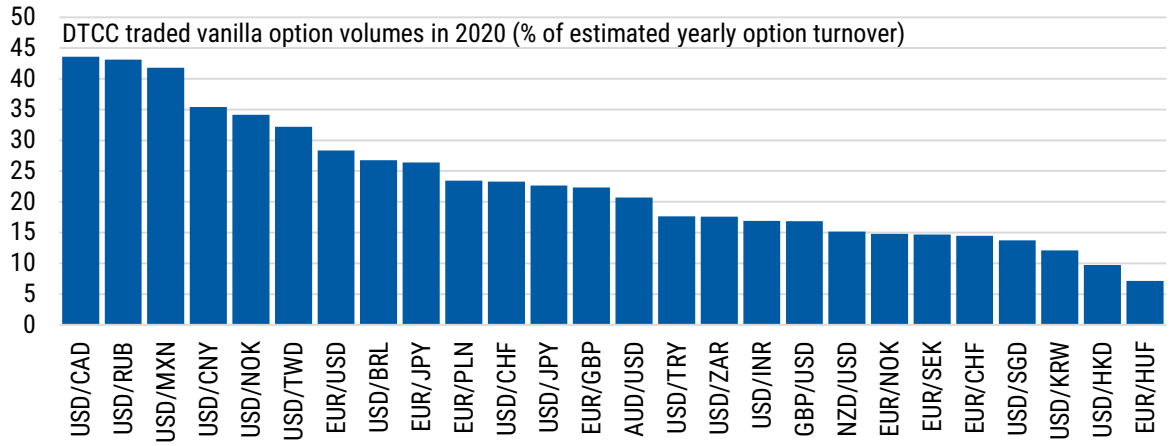
2) **Notional rounding/capping:** The notional amounts for each options trade are rounded for anonymity reasons, and there is also a reported notional cap of US$250 million for each reported trade, as explained in more detail in The DTCC data set. Our analysis shows that individual trades with notional capped at US$250 million have been generally rare (<2% of the sample on most currency crosses) and so should not greatly impact the positioning score.

3) **Missing strike data:** Not all vanilla options trades reported include information on the strike level. When a strike level is not explicitly reported, the value in the exchange rate column is used instead. This does not have direct implications for the positioning score itself as it is the notional amount that is used for the calculation (which is always included for vanilla options). It does however impact the "positioning concentration by strike" charts that are included in FX spot level positioning concentration and can partly explain why a large proportion of positioning appears to be concentrated around the current at-the-money strike.

4) **Data set coverage varies by currency:** The coverage of the data set is not the same across different currency pairs: For each currency cross in our universe, we looked at the total volume of vanilla options reported to DTCC in 2020 and compared it to an estimate of yearly volumes that uses 2019 BIS options turnover.

The comparison is not perfect because BIS volumes incorporate all different options products, not just vanillas, and so the data set coverage appears smaller than it otherwise should have. Even so, Exhibit 39shows that our data set coverage varies depending on the currency considered. The chart shows that the DTCC options volumes we used for 2020 in our calculation are around 43% of the USD/CAD traded options volumes estimated for 2019 relative to the same number being below 10% for EUR/HUF. In particular, we do not take into account exotic options in our volume calculation, which the BIS would take into account, and the DTCC reporting is skewed towards US-based traders and investors, while the BIS is surveying globally.

Exhibit 39: Proportion of traded FX option volumes covered by the DTCC dataset



Source: DTCC, BIS, Morgan Stanley Research; Note: For crosses where USD is not the base currency, DTCC volumes are converted into USD using the average exchange rate for the year. Yearly option turnover is calculated using BIS daily option turnover volumes for 2019. Note that the denominator includes all FX option products (not just vanillas).

Other FX positioning metrics

The FX options positioning indicator is capturing a specific type of investor that likes to use leverage to express a view on the market. According to a BIS survey, the largest volume of daily FX options trades, outside of the banks and financial institutions, are done by hedge funds. So, we would use this options positioning metric to be a short-term positioning indicator and one that doesn't capture all market participants.

One key group that may not be as well represented is long-term asset managers who may use options, forwards, spot and swaps currency markets to express views. Asset managers may also hold assets in a currency outside of their reporting currency, which may also be considered as an FX position. There is less frequent data available for this group of investors. Below we list information that we suggest adding to the options positioning metric to get a broader view on market currency positioning.

Currency futures position data from the CFTC
The CFTC reports outstanding long and short futures contracts for positioning in many major currency pairs where the CME or ICE have created a futures contract. The data are typically released on a Friday and provide a breakdown of net positions by type of investor such as leveraged fund or asset manager, which we have used in the regular FX positioning tracker reports. The breakdown by type of investor is useful as other data sets don't provide that but the positioning information is limited to those who use futures contracts to gain FX exposure.

Futures positioning data are available for the following currency pairs: EUR/USD, GBP/USD, USD/JPY, GBP/USD, USD/CAD, AUD/USD, NZD/USD, USD/CHF, EUR/GBP, EUR/JPY, USD/MXN, USD/ZAR, USD/BRL and USD/RUB as well as the DXY USD index. The disadvantage of these data are that they are delayed, with the Friday release being for positions as of the prior Tuesday and that there are a limited range of currencies with positioning information. NOK and SEK are not included within the G10 as an example.

Our cross-asset team found that CFTC positioning data have been better momentum indicators for currencies on the 3-month forward-looking time horizon, similar to what we observed for the DXY USD index using our FX options positioning indicator. They found that other asset positioning are better contrarian indicators for equities and long-end rates.

International asset ownership data
Each country's equity and debt markets may have a varying amount of foreign ownership relative to the size of the market. In our analysis of how FX performs at the end of the month, we showed that the US has the largest foreign ownership of its equity and debt markets within the G10 in absolute terms, followed by the eurozone. This international investment position data are typically available monthly or quarterly, with a bit of a delay (from the IMF or local country statistics/finance offices). We follow the flow data closely but the relationship between the flow and the currency (positioning or performance) isn't clear cut.

To assess the size of the FX exposure, we also need to have information on whether the asset owners overlay with an FX hedge. The FX hedge ratio information is less readily

available, making a true estimate of FX positioning difficult. We monitor FX hedging behavior of Japanese life insurers and Australia's pension funds, holding international assets. Similar high-frequency data from other countries are less widely available.

Our EM team publish a monthly positioning metric for EM bond and FX exposure of asset managers, which utilizes real positioning data as published by the asset owners. The data are published monthly, with a small delay.

Systematic momentum trading

Trading a variety of assets and currencies based on their recent momentum is an approach used by systematic investors, sometimes classified as CTAs. We explored their performance and strategies in a recent article. CTA fund assets reached almost US$320 billion earlier this year. Currency-specific CTA trader assets have grown almost every quarter since mid-2019, doubling the proportion of total CTA assets from currency-only funds to 8.5%.

A way of estimating CTA FX positioning is by predicting what their models may suggest being long or short. Our team publishes a CTA trends indicator (see here) which ranks G10 currency momentum versus the others. This isn't a measure of positioning but an estimate of how the systematic investors could be positioned. The indicator can also be calculated daily or intraday so is as real-time as our FX options positioning indicator.

Market sentiment

Our FX options positioning score is a contrarian indicator for many G10 currencies but a momentum indicator for some EM currencies. Alternative metrics that provide information on whether sentiment is extreme are helpful in adding to the broader positioning analysis. In our research we have been using a futures trader survey that provides the proportion of traders that are bullish on a particular asset or currency.

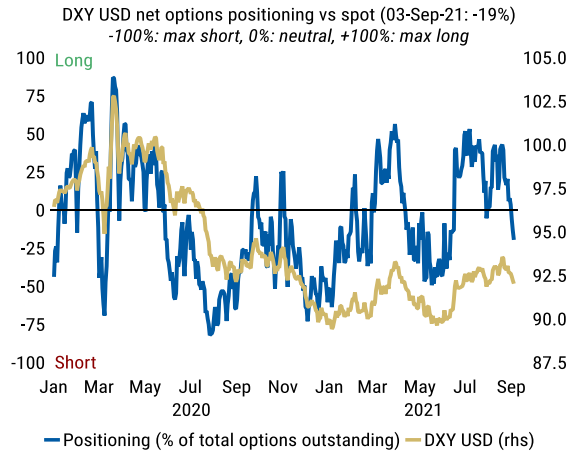
The Daily Sentiment Index (DSI) is published daily so is as high-frequency as the options positioning indicator but captures daily information and for a different type of currency instrument. Our backtesting of the DSI, published last year, shows that NZD and JPY in particular turn around when reaching extremes. For other G10 currencies the forward-looking trading signal isn't as strong throughout the whole history so we like to use the DSI as a way to rank G10 currency sentiment rather than infer a level of positioning in that currency.

FX positioning history by currency

The charts in this section show our options positioning indicator in blue relative to the performance of the currency pair or index. The charts show a short history from the start of 2020 to make it easy to see the patterns. We have data going further back to 2013/14 depending on the currency pair.

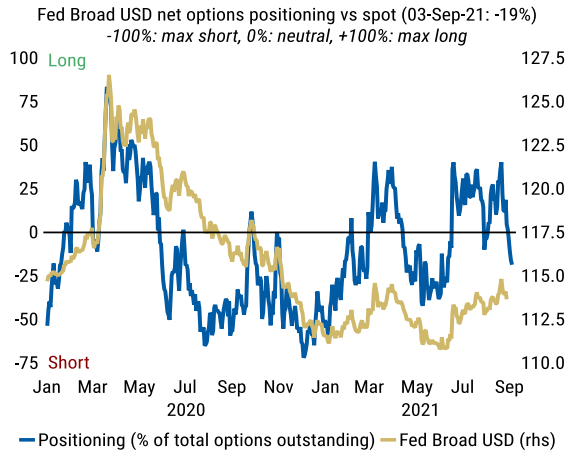
USD Aggregates

Exhibit 40: USD DXY Index



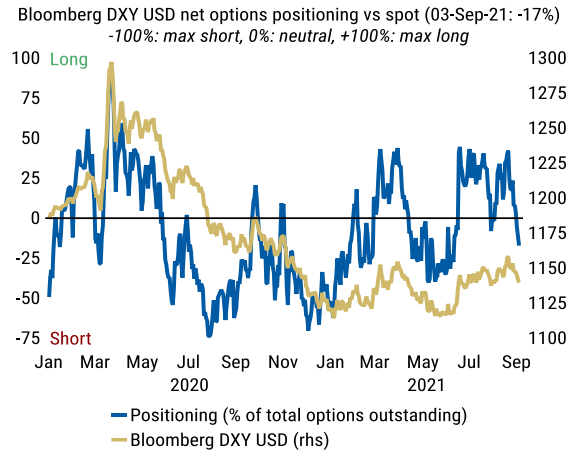
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 41: Fed's Broad USD Index



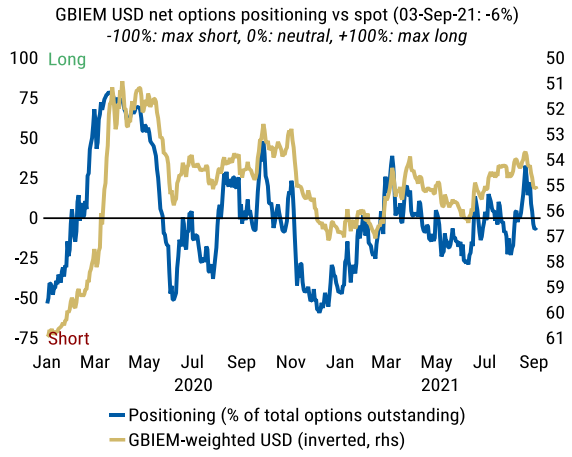
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 42: Bloomberg DXY Index



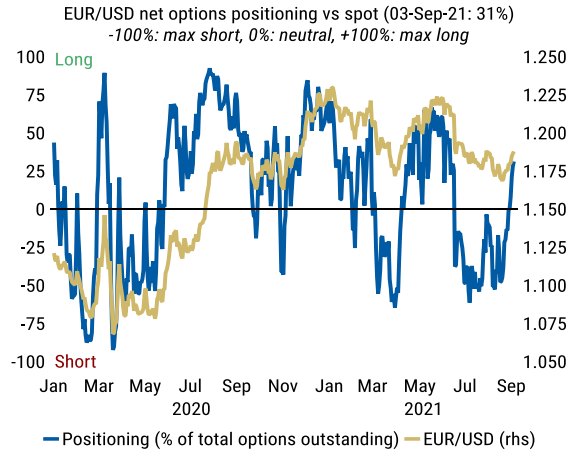
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 43: GBI-EM-weighted USD



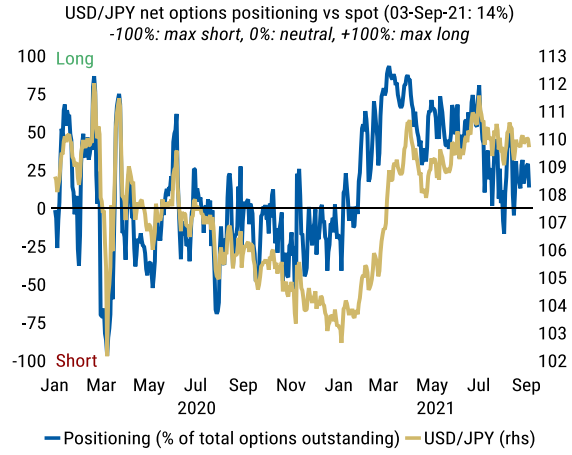
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 44: EUR/USD



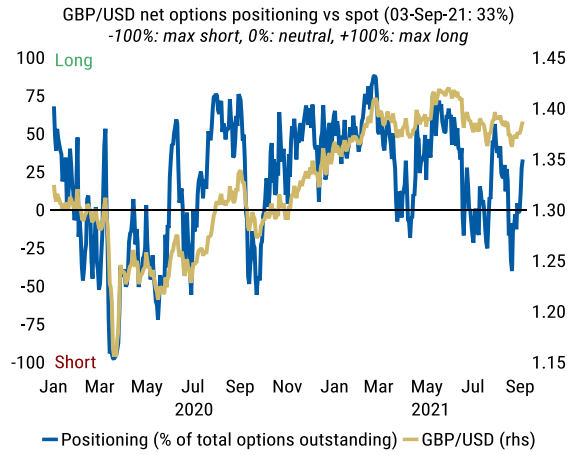
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 45: USD/JPY



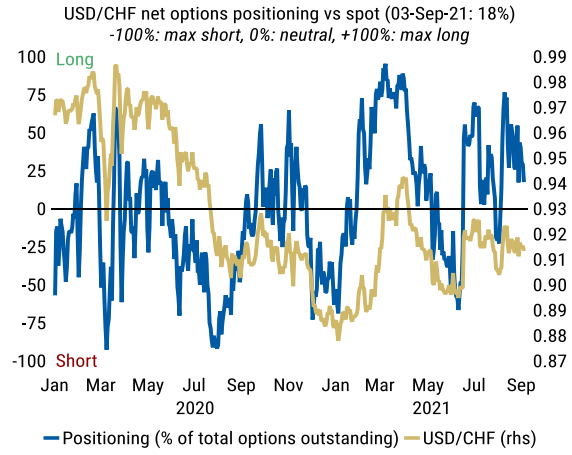
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 46: GBP/USD



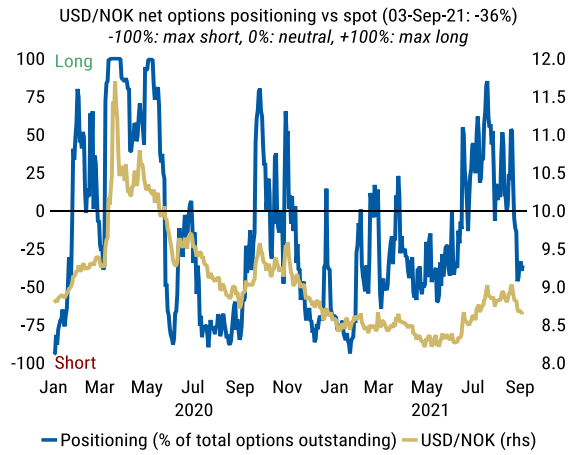
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 47: USD/CHF



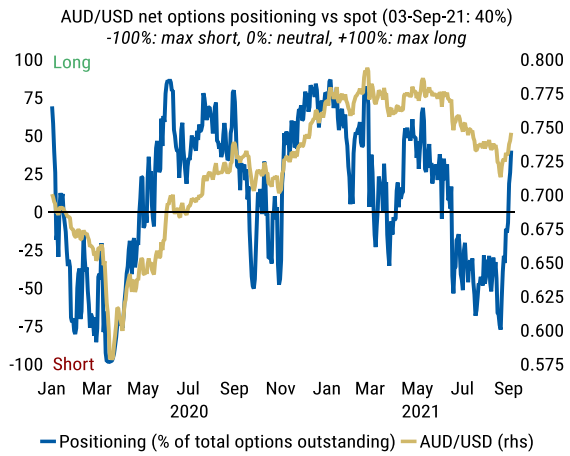
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 48: USD/NOK



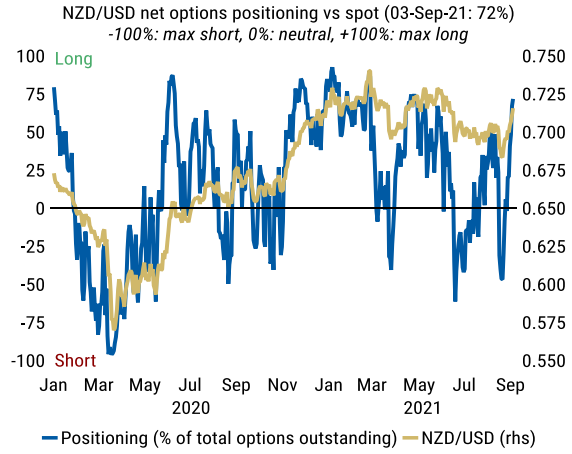
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 49: AUD/USD



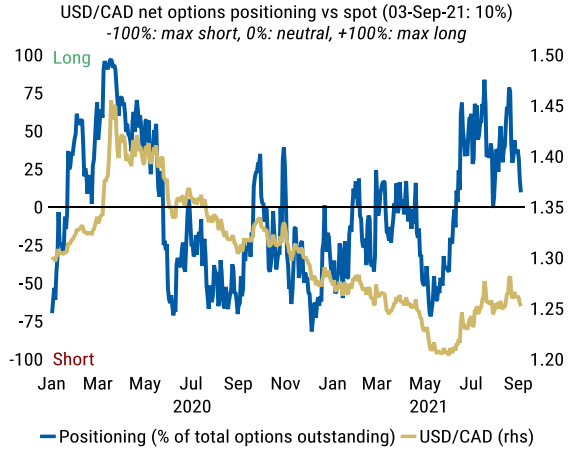
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 50: NZD/USD



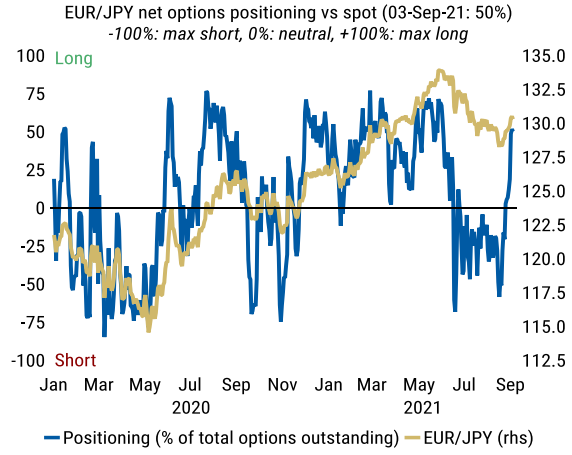
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 51: USD/CAD



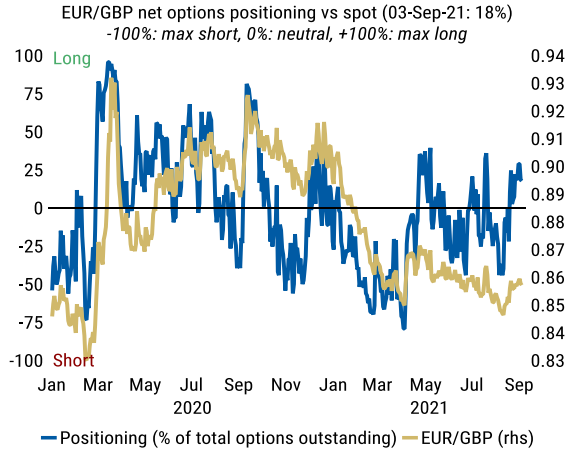
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 52: EUR/JPY



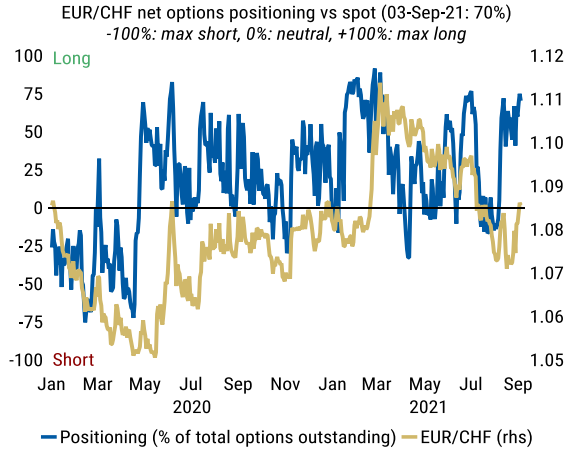
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 53: EUR/GBP



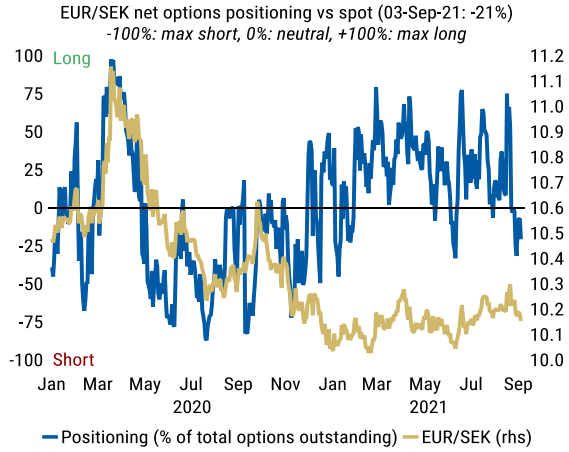
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 54: EUR/CHF



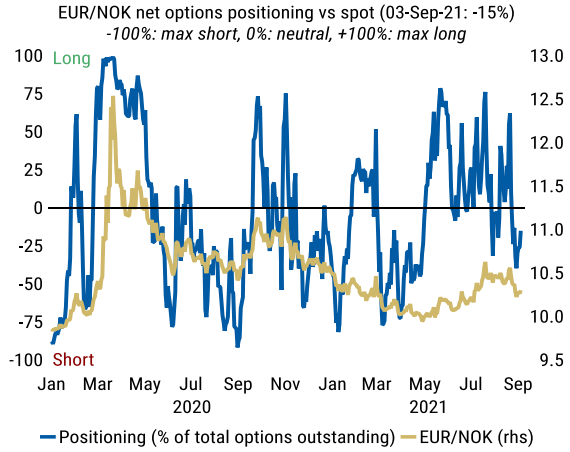
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 55: EUR/SEK



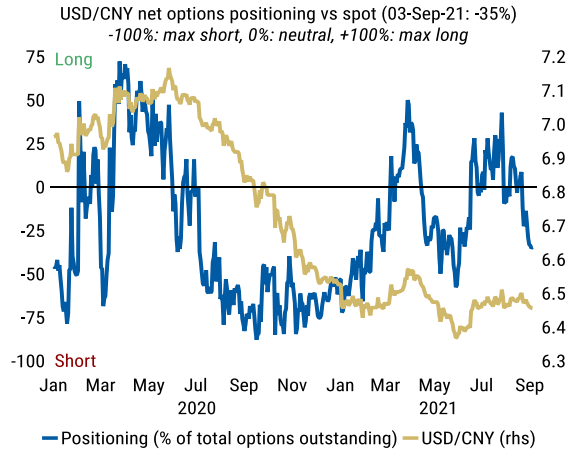
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 56: EUR/NOK



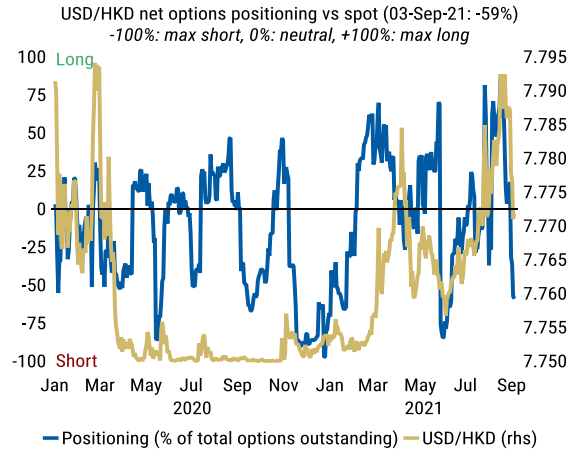
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 57: USD/CNY



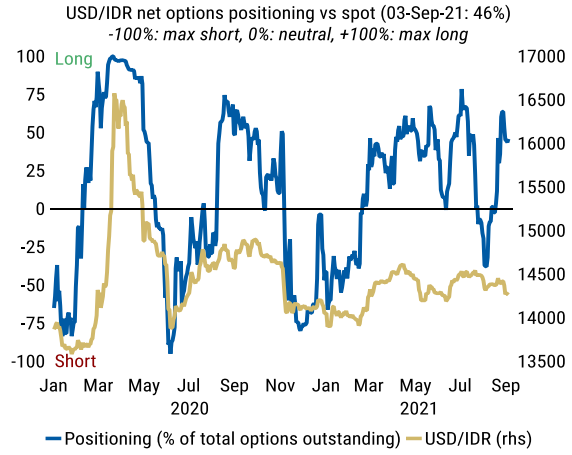
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 58: USD/HKD



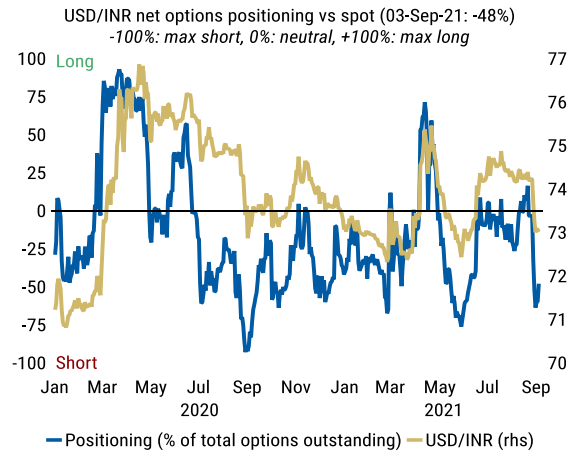
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 59: USD/IDR



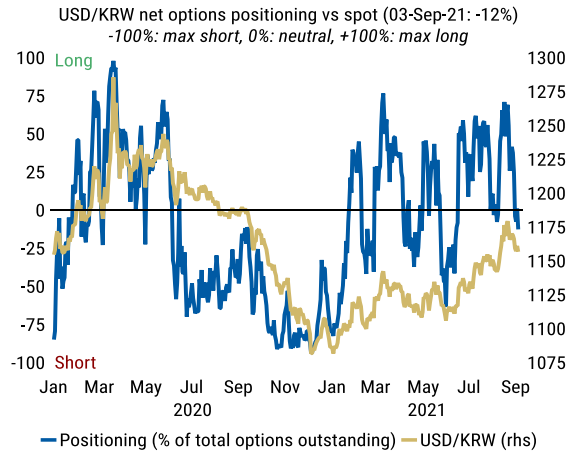
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 60: USD/INR



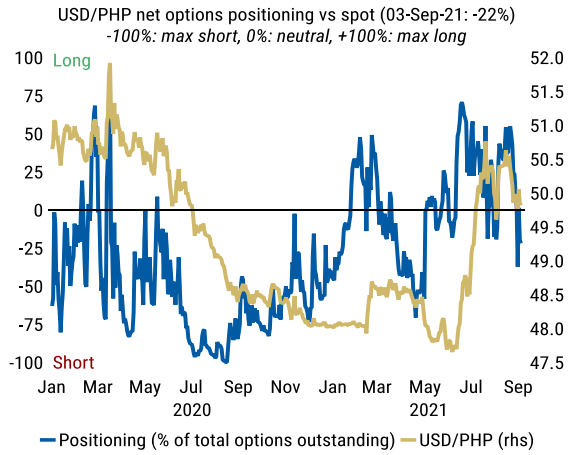
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 61: USD/KRW



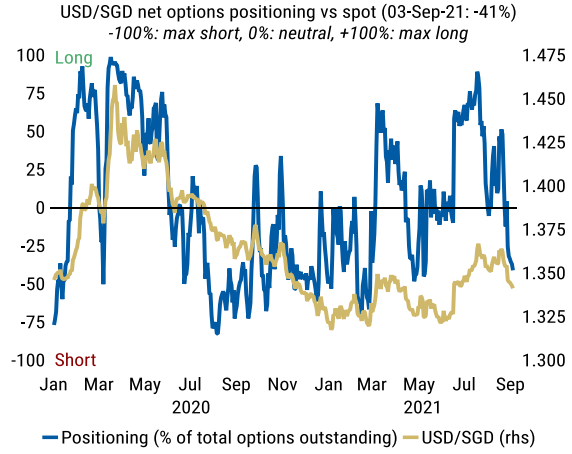
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 62: USD/PHP



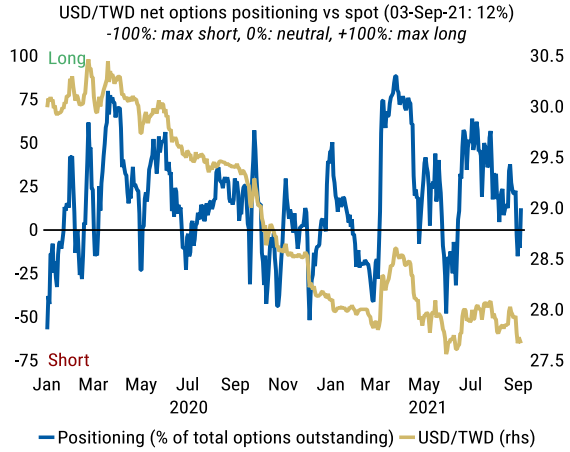
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 63: USD/SGD



Source: DTCC, Bloomberg, Morgan Stanley Research

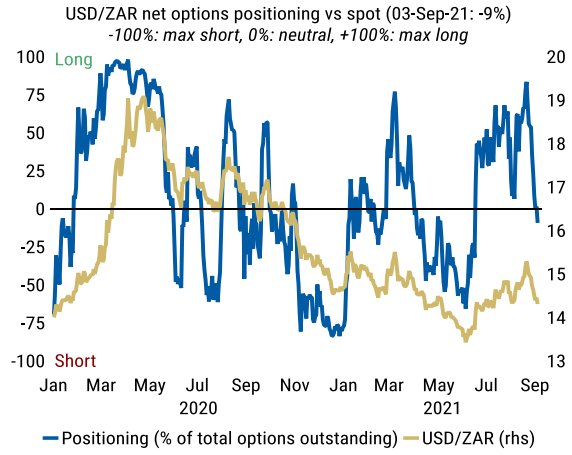
Exhibit 64: USD/TWD



Source: DTCC, Bloomberg, Morgan Stanley Research

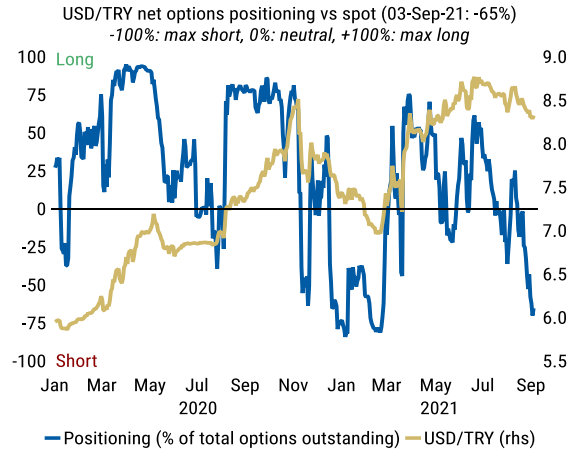
CEEMEA

Exhibit 65: USD/ZAR



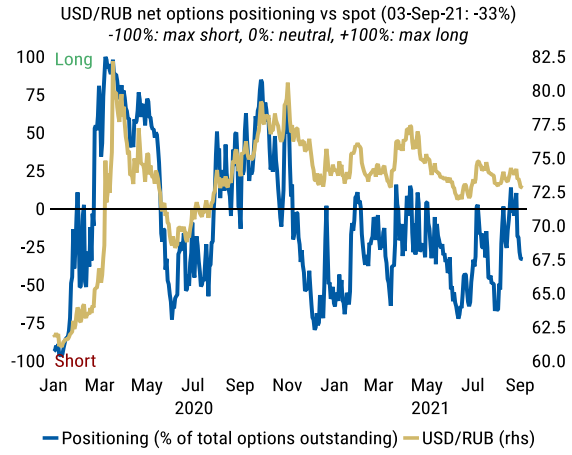
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 66: USD/TRY



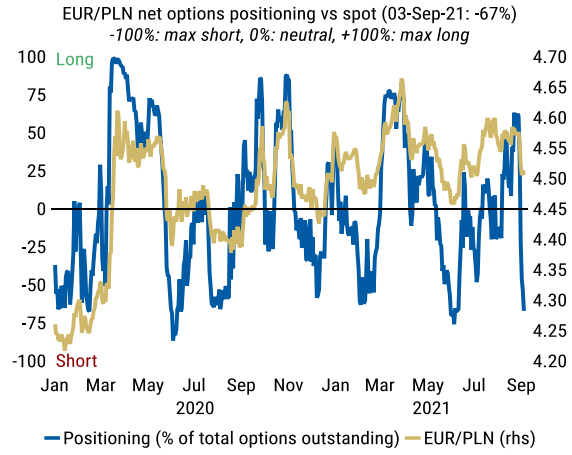
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 67: USD/RUB



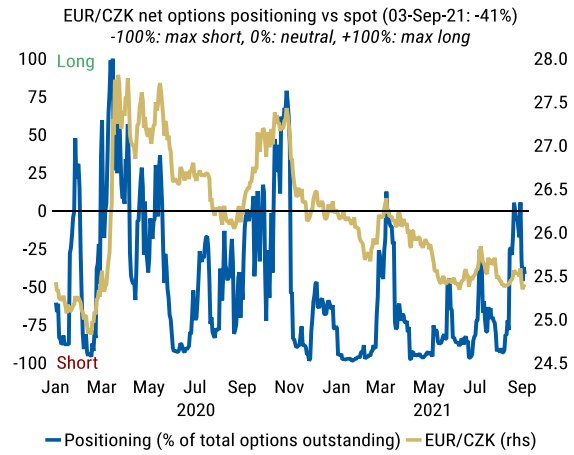
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 68: EUR/PLN



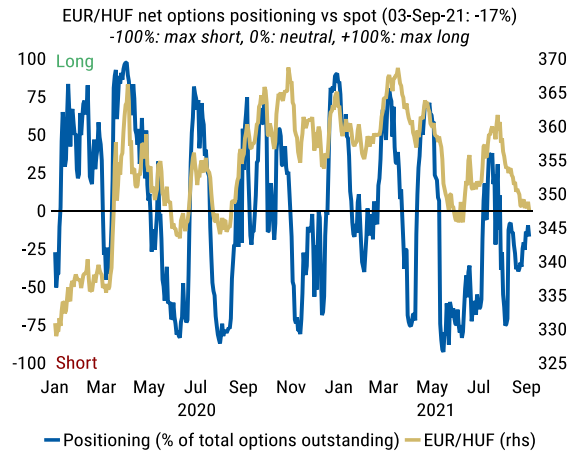
Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 69: EUR/CZK



Source: DTCC, Bloomberg, Morgan Stanley Research

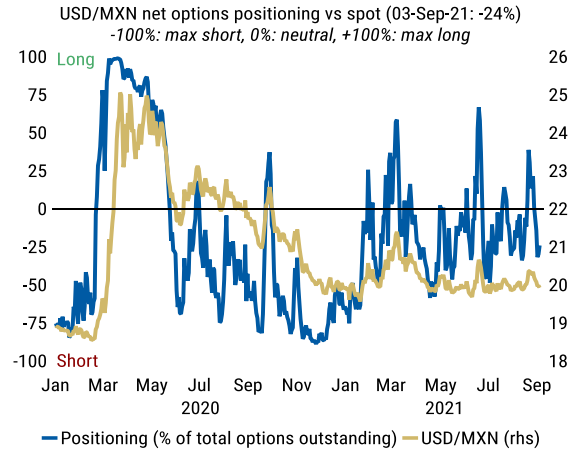
Exhibit 70: EUR/HUF



Source: DTCC, Bloomberg, Morgan Stanley Research

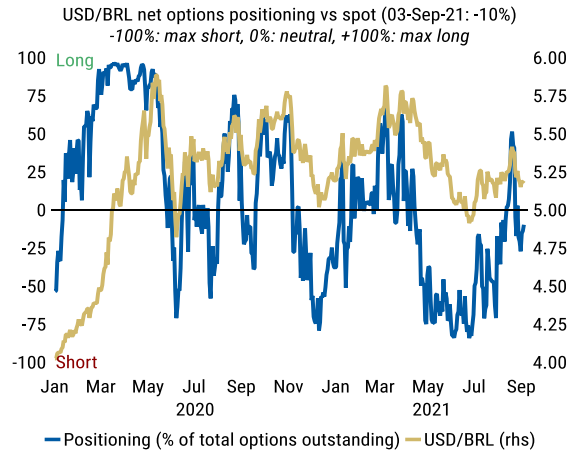
LatAm

Exhibit 71: USD/MXN



Source: DTCC, Bloomberg, Morgan Stanley Research

Exhibit 72: USD/BRL



Source: DTCC, Bloomberg, Morgan Stanley Research

FX spot level positioning concentration

Which spot level has the highest concentration of options positioning? For each of the charts below, we have aggregated net long (call) versus short (put) options positions for the currency pair at a specific range of levels for the strikes. For example, for EUR/USD we aggregate the notional outstanding of calls versus puts with strikes of 1.1650 to 1.1700 and show that with one bar on the chart. The aggregated range of strikes varies by currency pair.

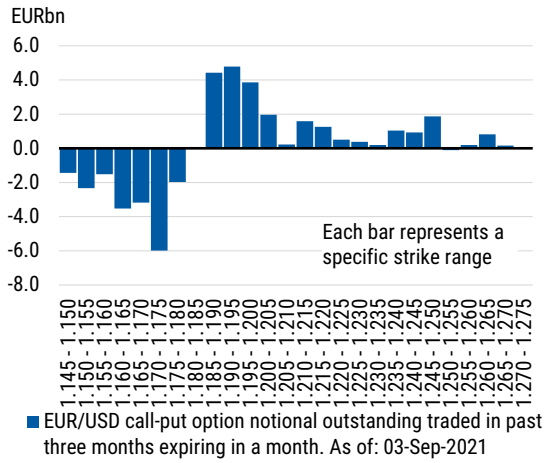
How to use these charts: The net options positioning gives an idea of the concentration of longs and shorts in the market for a particular currency pair. We have often found concentrations of positioning around the current at-the-money strike. On occasion, there may be positioning at extreme strike levels (very out of the money) with options positioning, and these may be to cover a large FX move over an upcoming risk event.

Should spot markets be moving quickly on a particular day, these charts provide a guide of the size of the market's profit or loss. For example, if spot is falling below the level where there are many outstanding long positions via calls, the more that spot falls, the larger the loss for these positions (from premium paid).

We have often used technical analysis to identify key levels to watch for a particular currency pair. The net options positioning bar charts with strike concentrations can also provide a quantitative way of indicating key levels to watch.

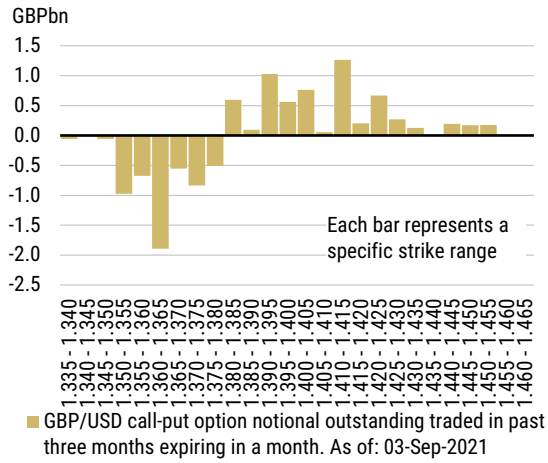
Alternative charts using spot strike data: Should a particular currency have a large volume of outstanding call positions, it may be useful to look at the distribution of strikes for the calls alone. We could show these charts (or the equivalent for puts) in our research if a particular currency or event is in focus. Similarly it may be useful to plot the positioning at levels as a percentage relative to spot to give an idea of the expected market volatility. We show these charts for EUR/USD as an example in Exhibit 102 to Exhibit 107. We are able to provide these charts on request for other currencies too.

Exhibit 73: EUR/USD net exposure via options at different spot levels



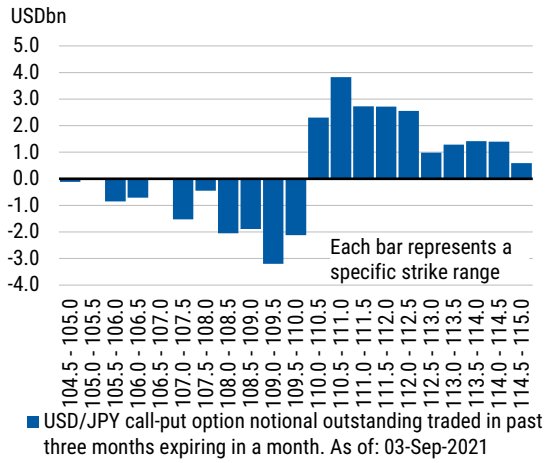
Source: DTCC, Morgan Stanley Research

Exhibit 74: GBP/USD net exposure via options at different strike levels



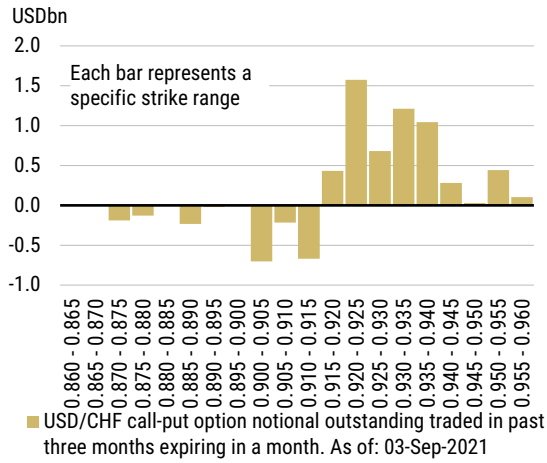
Source: DTCC, Morgan Stanley Research

Exhibit 75: USD/JPY net exposure via options at different strike levels



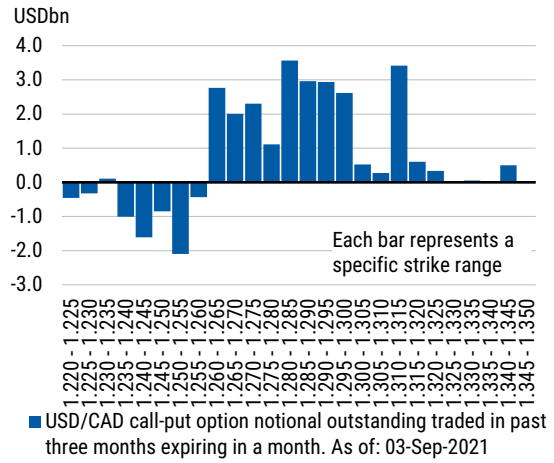
Source: DTCC, Morgan Stanley Research

Exhibit 76: USD/CHF net exposure via options at different strike levels



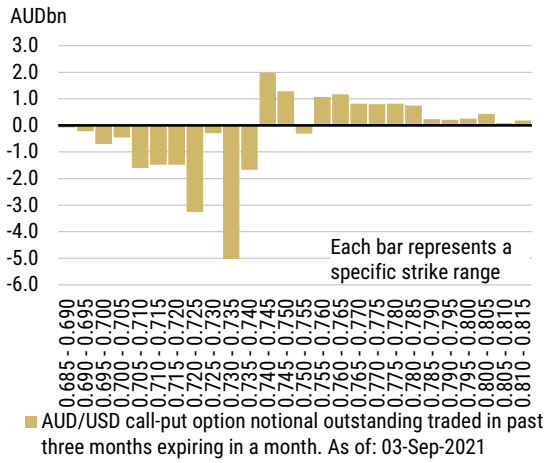
Source: DTCC, Morgan Stanley Research

Exhibit 77: USD/CAD net exposure via options at different strike levels



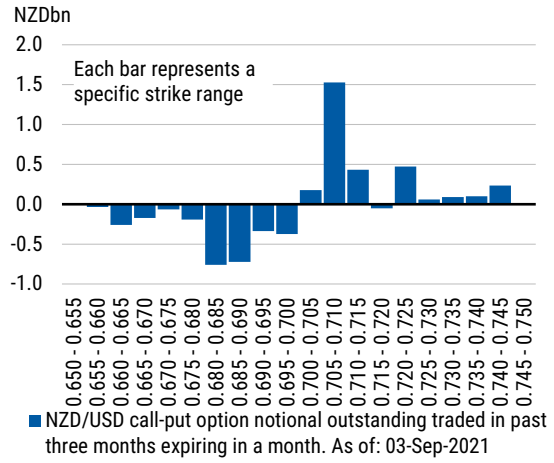
Source: DTCC, Morgan Stanley Research

Exhibit 78: AUD/USD net exposure via options at different strike levels



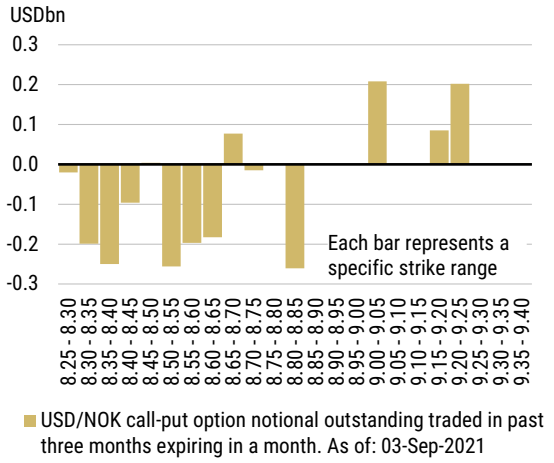
Source: DTCC, Morgan Stanley Research

Exhibit 79: NZD/USD net exposure via options at different strike levels



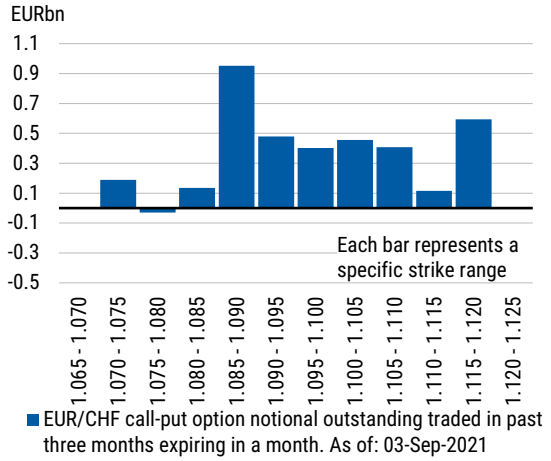
Source: DTCC, Morgan Stanley Research

Exhibit 80: USD/NOK net exposure via options at different strike levels



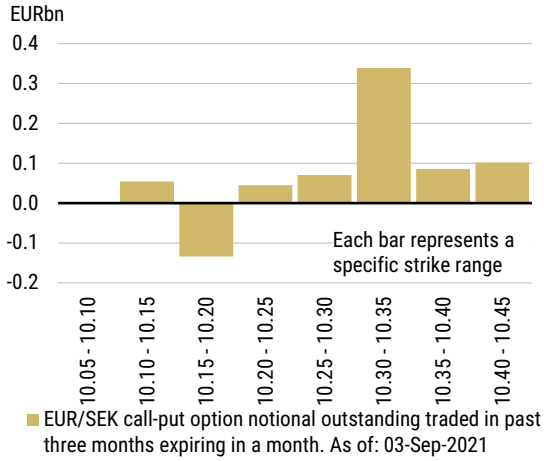
Source: DTCC, Morgan Stanley Research

Exhibit 81: EUR/CHF net exposure via options at different strike levels



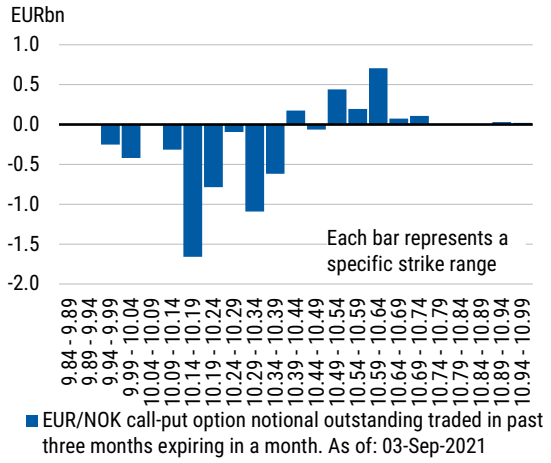
Source: DTCC, Morgan Stanley Research

Exhibit 82: EUR/SEK net exposure via options at different strike levels



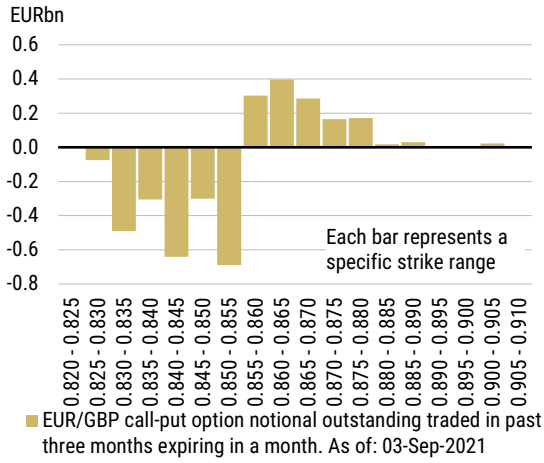
Source: DTCC, Morgan Stanley Research

Exhibit 83: EUR/NOK net exposure via options at different strike levels



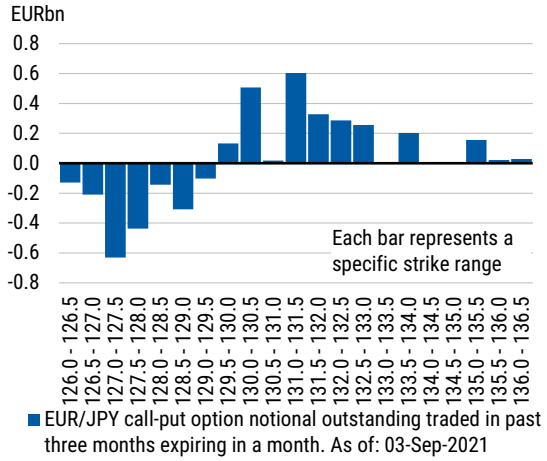
Source: DTCC, Morgan Stanley Research

Exhibit 84: EUR/GBP net exposure via options at different strike levels



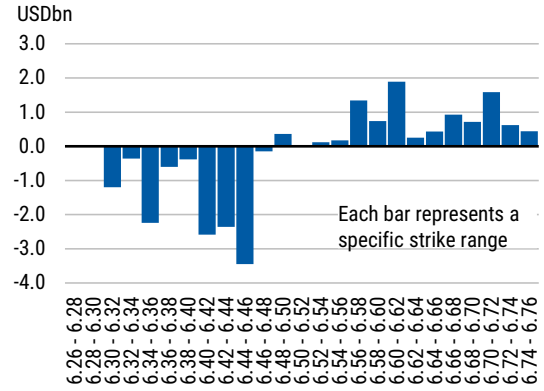
Source: DTCC, Morgan Stanley Research

Exhibit 85: EUR/JPY net exposure via options at different strike levels



Source: DTCC, Morgan Stanley Research

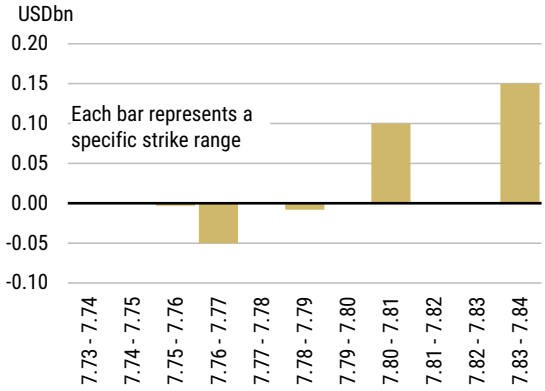
Exhibit 86: USD/CNY net exposure via options at different spot levels



USD/CNY call-put option notional outstanding traded in past three months expiring in a month. As of: 03-Sep-2021

Source: DTCC, Morgan Stanley Research

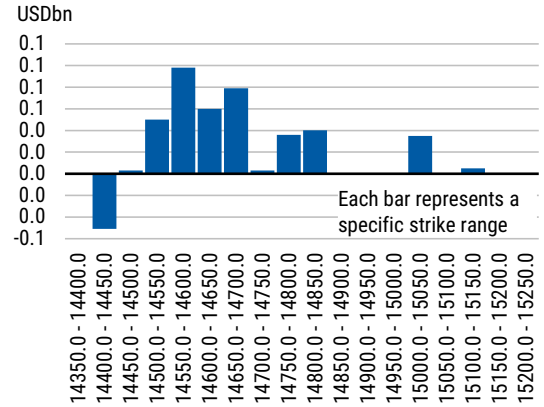
Exhibit 87: USD/HKD net exposure via options at different strike levels



USD/HKD call-put option notional outstanding traded in past three months expiring in a month. As of: 03-Sep-2021

Source: DTCC, Morgan Stanley Research

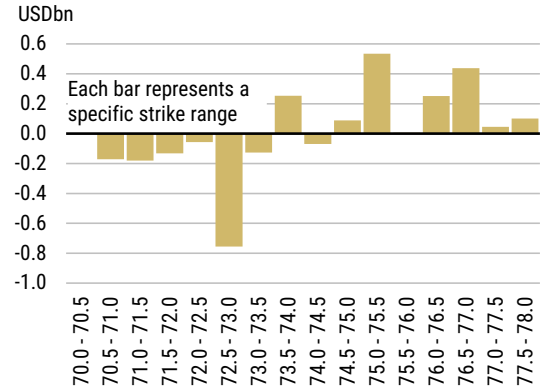
Exhibit 88: USD/IDR net exposure via options at different strike levels



USD/IDR call-put option notional outstanding traded in past three months expiring in a month. As of: 03-Sep-2021

Source: DTCC, Morgan Stanley Research

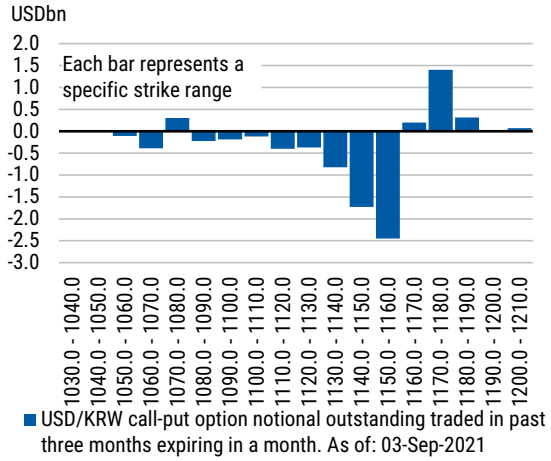
Exhibit 89: USD/INR net exposure via options at different strike levels



USD/INR call-put option notional outstanding traded in past three months expiring in a month. As of: 03-Sep-2021

Source: DTCC, Morgan Stanley Research

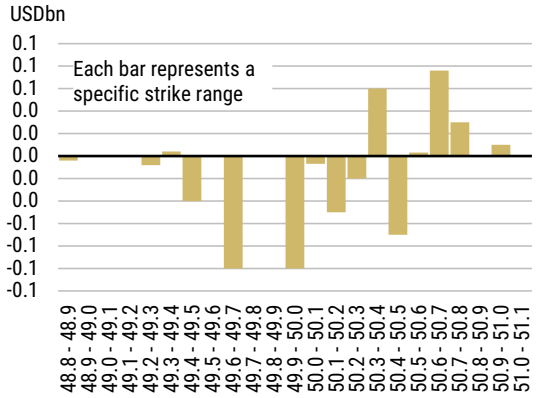
Exhibit 90: USD/KRW net exposure via options at different strike levels



USD/KRW call-put option notional outstanding traded in past three months expiring in a month. As of: 03-Sep-2021

Source: DTCC, Morgan Stanley Research

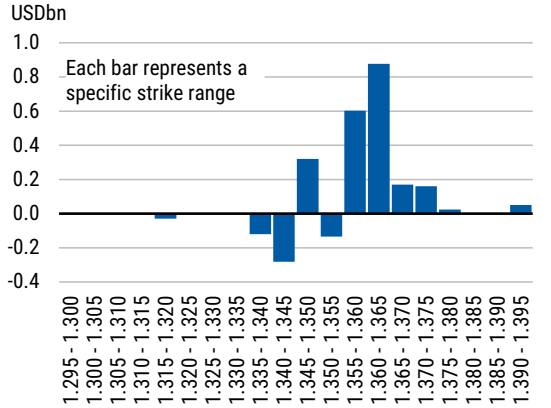
Exhibit 91: USD/PHP net exposure via options at different strike levels



USD/PHP call-put option notional outstanding traded in past three months expiring in a month. As of: 03-Sep-2021

Source: DTCC, Morgan Stanley Research

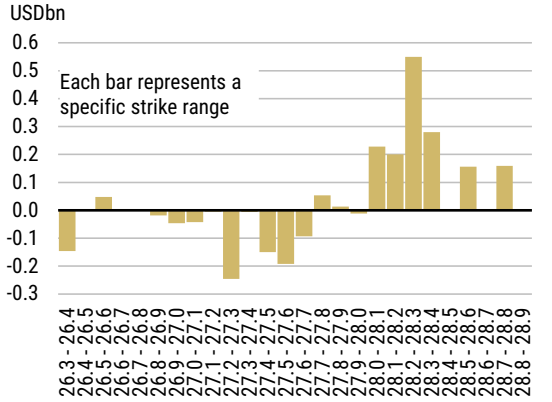
Exhibit 92: USD/SGD net exposure via options at different strike levels



USD/SGD call-put option notional outstanding traded in past three months expiring in a month. As of: 03-Sep-2021

Source: DTCC, Morgan Stanley Research

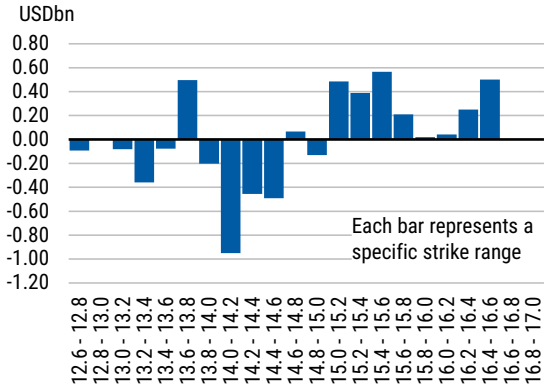
Exhibit 93: USD/TWD net exposure via options at different strike levels



USD/TWD call-put option notional outstanding traded in past three months expiring in a month. As of: 03-Sep-2021

Source: DTCC, Morgan Stanley Research

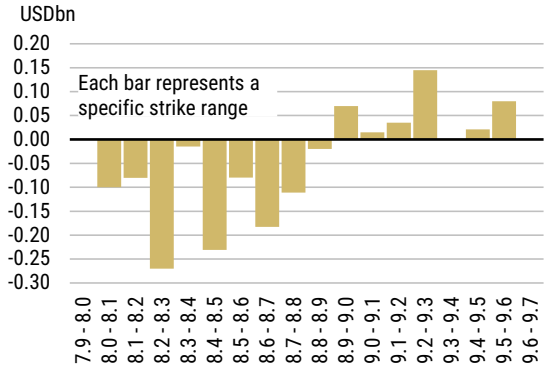
Exhibit 94: USD/ZAR net exposure via options at different spot levels



USD/ZAR call-put option notional outstanding traded in past three months expiring in a month. As of: 03-Sep-2021

Source: DTCC, Morgan Stanley Research

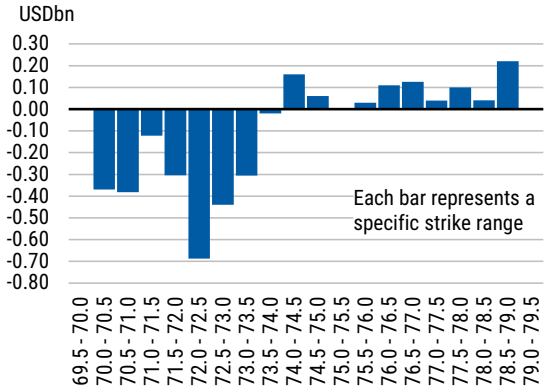
Exhibit 95: USD/TRY net exposure via options at different strike levels



USD/TRY call-put option notional outstanding traded in past three months expiring in a month. As of: 03-Sep-2021

Source: DTCC, Morgan Stanley Research

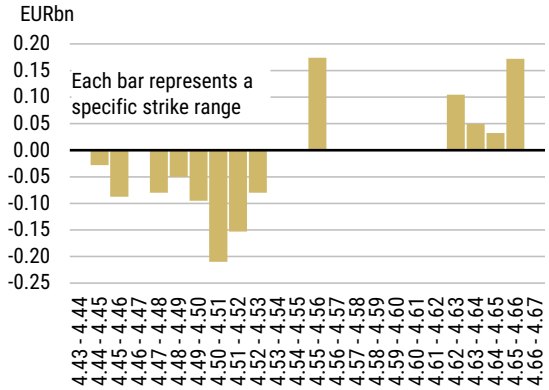
Exhibit 96: USD/RUB net exposure via options at different strike levels



USD/RUB call-put option notional outstanding traded in past three months expiring in a month. As of: 03-Sep-2021

Source: DTCC, Morgan Stanley Research

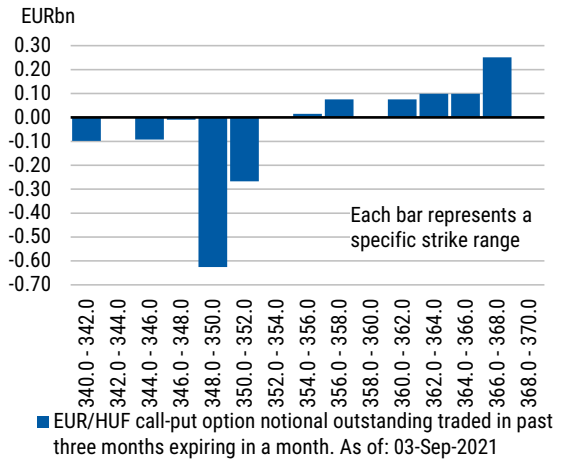
Exhibit 97: EUR/PLN net exposure via options at different strike levels



EUR/PLN call-put option notional outstanding traded in past three months expiring in a month. As of: 03-Sep-2021

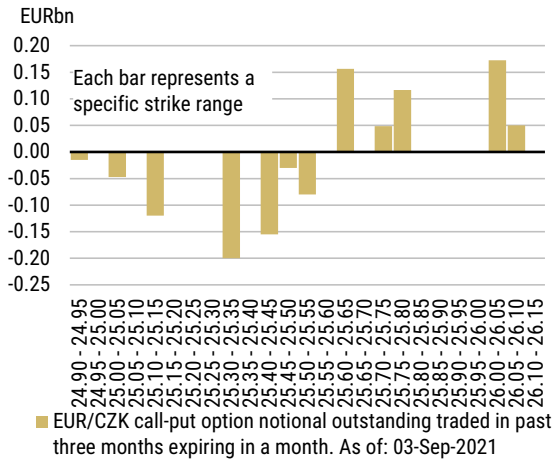
Source: DTCC, Morgan Stanley Research

Exhibit 98: EUR/HUF net exposure via options at different strike levels



Source: DTCC, Morgan Stanley Research

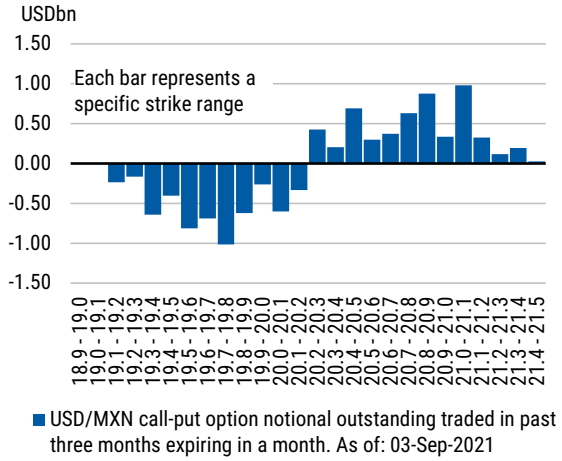
Exhibit 99: EUR/CZK net exposure via options at different strike levels



Source: DTCC, Morgan Stanley Research

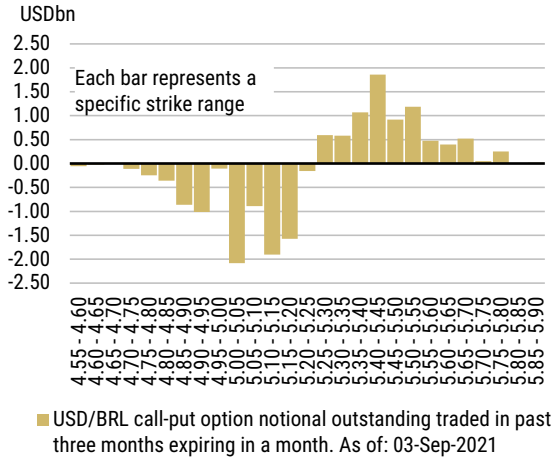
LatAm

Exhibit 100: USD/MXN net exposure via options at different spot levels



Source: DTCC, Morgan Stanley Research

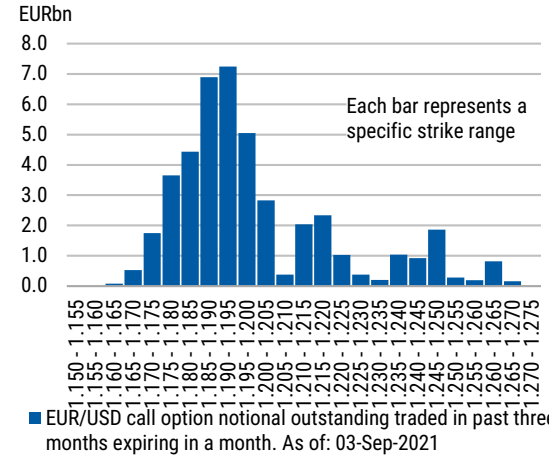
Exhibit 101: USD/BRL net exposure via options at different strike levels



Source: DTCC, Morgan Stanley Research

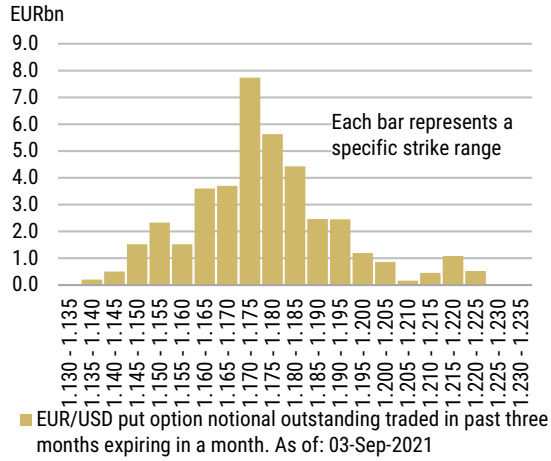
Alternative bar charts (example for EUR/USD)

Exhibit 102: EUR/USD calls exposure via options at different spot levels



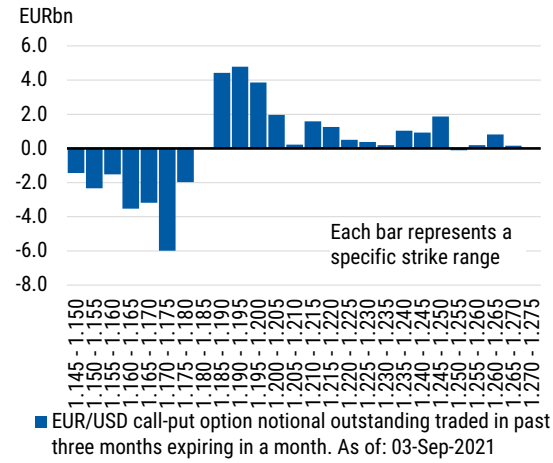
Source: DTCC, Morgan Stanley Research

Exhibit 103: EUR/USD puts exposure via options at different spot levels



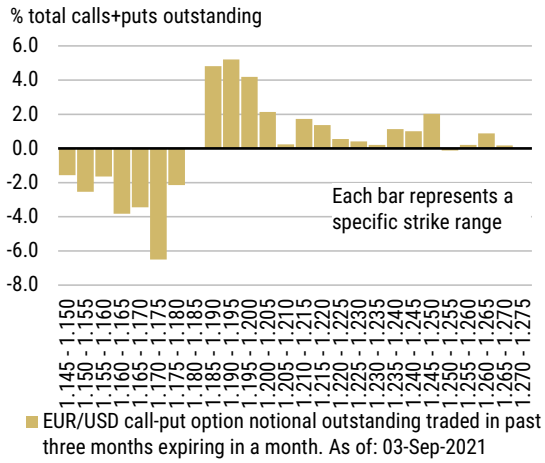
Source: DTCC, Morgan Stanley Research

Exhibit 104: EUR/USD net exposure via options at different spot levels



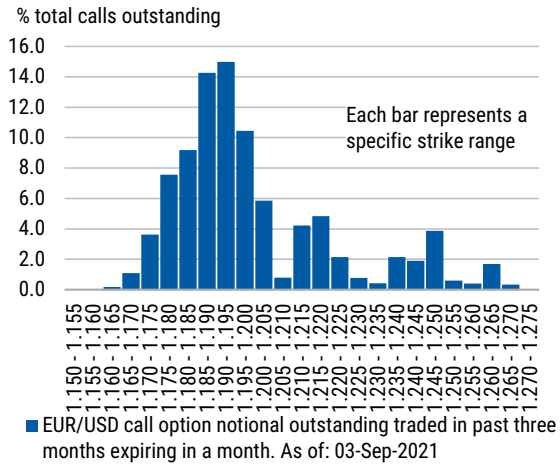
Source: DTCC, Morgan Stanley Research

Exhibit 105: EUR/USD net exposure via options at different spot levels (% total)



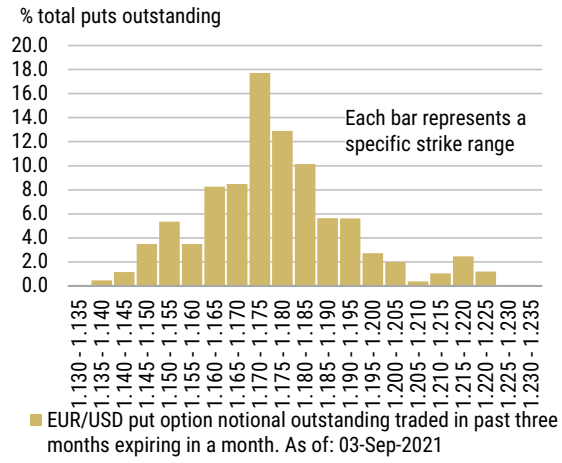
Source: DTCC, Morgan Stanley Research

Exhibit 106: EUR/USD calls exposure via options at different spot levels (% total)



Source: DTCC, Morgan Stanley Research

Exhibit 107: EUR/USD puts exposure via options at different spot levels (% total)



Source: DTCC, Morgan Stanley Research

Appendix

The DTCC data set

What is the DTCC Data Repository?

Since 2012, global regulatory reform within the OTC derivatives markets has required financial services firms to report their OTC derivatives transactions, with the aim to improve transparency and enable regulators to monitor systemic risk in the derivatives market. The DTCC Data Repository is one service that allow firms to fulfil those requirements, by providing an interface for global regulatory reporting and also a dissemination dashboard where publicly available information is being disseminated to the market. It is that publicly available information that is being used for the options positioning estimates featured in this report.

Who reports trades to DTCC SDR?

There are a number of market participants that are allowed to report trades in the depository. DTCC provides open access by allowing parties to trade and third-party providers to report directly. Possible reporting entities thus include:

- Parties to the trade (brokers, banks, asset managers, corporates, etc.)
- Electronic execution platforms (exchanges, Swap Execution Facilities (SEFs), Organized Trading Facilities (OTFs), Designated Contract Markets (DCMs))
- Clearing houses (CCPs) and Derivatives Clearing Organizations (DCOs)
- Confirmation providers
- Intermediaries (i.e., Interdealer brokers)
- Custodians and asset servicers
- Any other middleware providers

The data set we use comes from the DTCC's Global Trade Repository service (GTR) Americas, which is registered with the Commodity Futures Trading Commission (CFTC). *The data set thus includes trades from market participants that are bound by the US derivative reporting requirements, including asset managers, hedge funds and corporates.*

Do reported trades predominantly originate from US clients?

While DTCC operates multiple depository services globally that help to address different local regulatory requirements, the data set we use comes from the DTCC's Global Trade Repository service (GTR) Americas. That depository is registered with the Commodity Futures Trading Commission (CFTC) and is thus designed to allow market participants to meet the reporting obligations of the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act).

That means the traded options data used for the positioning calculation are likely to be more representative of market participants that are bound by the US derivative reporting requirements and so are residing/operating/licensed in the United States. Even so, the inter-connectivity of financial markets and hierarchy of trade reporting (outlined

in a later subsection) means we believe these data serve as a good approximation of broader options market positioning. Alternative data sets which cover different reporting requirements (such as MiFiD) are also available, but reported volumes are far smaller than those in the DTCC dataset.

What asset classes/instruments are covered?

All asset classes are supported for both Over-the-counter (OTC) and Exchange Traded Derivatives – credit, rates, equities, foreign exchange and commodities. Our focus on this report is on the foreign exchange options data.

Are all trades required to be reported?

No. Under Part 43 of the CFTC regulations, any executed swap (cleared and uncleared) that is an arm's length transaction between two parties and results in a corresponding change in the market risk position between the two parties needs to be publicly reported.

However, the following exclusions apply:
- Internal swaps between 100%-owned subsidiaries (affiliates) of the same parent entity, as this may create an inaccurate appearance of market depth and does not have price discovery or transparency value
- Portfolio compression exercises, as the purpose is to mitigate risk between counterparties

For Foreign Exchange transactions in particular, transactions that fall under the exemption from the US Department of the Treasury (i.e., physically settled FX swaps and FX forwards that have fixed payment obligations, short-term instruments, and are based on settlement risk rather than counterparty risk) are not reportable.

More information about rules on US derivatives trade reporting can be found here.

Which counterparty is required to report the trade?

Under parts 43, 45 and 46 of the CFTC regulations, the following applies:

For swaps executed on Swap Execution Facilities (SEF) or Designated Contract Markets (DCM), trades must be reported to a real-time disseminator "as soon as technologically practicable".

For off-facility swaps, one party to the swap (called the reporting party) needs to report data as determined by the following hierarchy (unless otherwise agreed by the parties prior to the execution of the swap):

- If one party is a swap dealer (SD) and the other party is a major swap participant (MSP), SD is the reporting party
- If no party is an SD but one party is an MSP, MSP is the reporting party
- If both parties are SD or MSPs, parties to agree who is the reporting party
- If neither is an SD or MSP, but one party is a financial entity, financial entity is the reporting party
- In all other cases, parties to agree who is the reporting party

Are all trades being reported promptly to DTCC?

Yes. Under Part 43 of the CFTC regulations, swap transaction and pricing data are generally reportable "as soon as technologically practicable" after execution, which is 15 minutes for most standard-sized transactions. The DTCC public dissemination dashboard provides slices of reported trades every minute (found under the "General Slice Reports" section), but for the purposes of this report the daily snapshots (found under the "Cumulative Slice Reports" section) are being used instead. Amendments and cancellations of previously reported trades do occur from time to time, but in our experience those have been small/infrequent and are not having a significant impact on the positioning calculation.

Are there any restrictions to the disseminated information?

Yes. Disseminated information is available at an aggregate and anonymous level for the purpose of providing transparency of the size of the market, e.g., number of outstanding positions and notional amounts to the public at large. As such, the counterparties' identities and other private information are not being disclosed.

More information about what the type of information that is publicly disseminated can be found here and here.

For the purposes of the options positioning calculation, there are two key limitations: (1) the side (buy/sell) of each options trade is not disclosed, as each trade takes place between two counterparties that take opposing sides in the transaction, and (2) the notional amounts for each options trade are being rounded (and potentially capped) to protect the anonymity of the counterparties.

The rounding is done according to rules found in Exhibit 108, and the notional for each individual reported trade is capped at US$250 million. The number of trades with notional of precisely US$250 million (indicating that they have been capped) has been small in the currencies covered in this report.

Exhibit 108: DTCC notional rounding and capping rules

Actual Notional (USD)	Rounded Notional (USD)	Disseminated Notional (USD)	Rule applied
1	5	5	If the notional or principal amount is less than one thousand, round to nearest five, but in no case shall a publicly disseminated notional or principal amount be less than five;
4	5	5	
7	5	5	
8	10	10	
986	985	985	
989	990	990	
987.5	990	990	
8867	8900	8900	If the notional or principal amount is less than ten thousand but equal to or greater than one thousand, round to nearest one hundred
8849	8800	8800	
10,234	10,000	10,000	If the notional or principal amount is less than 100 thousand but equal to or greater than ten thousand, round to nearest one thousand
10,598	11,000	11,000	
478,237	480,000	480,000	If the notional or principal amount is less than one million but equal to or greater than 100 thousand, round to nearest ten thousand
494,363	490,000	490,000	
73,863,964	74,000,000	74,000,000	If the notional or principal amount is less than 100 million but equal to or greater than one million, round to the nearest one million
73,499,999	73,000,000	73,000,000	
387,453,899	390,000,000	250,000,000+	If the notional or principal amount is less than 500 million but equal to or greater than 100 million, round to the nearest ten million; However, Capped at 250 million.
384,453,899	380,000,000	250,000,000+	

Source: DTCC

FX options positioning backtest: More details

Exhibit 109: Is FX options positioning a contrarian or a momentum indicator for each currency pair?

Is FX options positioning a contrarian or momentum indicator?								
When positioning flags…	V. Short				V. Long			
After…	1 week	2 weeks	1 month	3 months	1 week	2 weeks	1 month	3 months
CCY pair								
Fed Broad USD	Contrarian	Momentum	Momentum	-	-	-	Momentum	Contrarian
DXY	Contrarian	Momentum	Momentum	Momentum	Contrarian	Contrarian	Contrarian	Momentum
BBDXY	Contrarian	Momentum	Momentum	Momentum	Contrarian	Contrarian	Momentum	Contrarian
GBIEMFX USD	Contrarian	Contrarian	Contrarian	Contrarian	Momentum	Momentum	Momentum	Contrarian
EUR/USD	Contrarian	Contrarian	-	Contrarian	-	Momentum	Momentum	Momentum
USD/JPY	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**
GBP/USD	**Contrarian**	**Contrarian**	**Contrarian**	**Momentum**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**
USD/CHF	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**
USD/CAD	Momentum	Contrarian	Contrarian	Momentum	Contrarian	Contrarian	Momentum	Contrarian
AUD/USD	Contrarian	Contrarian	Contrarian	Contrarian	Momentum	Momentum	Contrarian	Contrarian
NZD/USD	Contrarian	Momentum	Momentum	Contrarian	Momentum	Momentum	Momentum	Contrarian
USD/NOK	**Contrarian**	**Contrarian**	**Momentum**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**
EUR/CHF	Contrarian	Contrarian	Contrarian	Momentum	Contrarian	Momentum	Momentum	Momentum
EUR/SEK	**Momentum**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**
EUR/NOK	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**
EUR/GBP	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**
EUR/JPY	Contrarian	Contrarian	Contrarian	Momentum	Momentum	Momentum	Momentum	Contrarian
USD/CNY	Momentum	Momentum	Momentum	Momentum	Momentum	Momentum	Momentum	Momentum
USD/INR	Contrarian	Contrarian	Contrarian	Contrarian	Momentum	Momentum	-	Momentum
USD/KRW	Contrarian	Momentum	Momentum	Momentum	-	Contrarian	Contrarian	Contrarian
USD/SGD	Momentum	Momentum	Momentum	Momentum	Momentum	Contrarian	Momentum	Contrarian
USD/TWD	**Momentum**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**
USD/HKD	-	Contrarian	Contrarian	Contrarian	Momentum	-	Contrarian	Contrarian
USD/IDR	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Momentum**	**Contrarian**	**Contrarian**
USD/PHP	Momentum	Momentum	Momentum	Momentum	Momentum	Momentum	Momentum	Momentum
USD/ZAR	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Momentum**	**Contrarian**	**Contrarian**	**Contrarian**
USD/TRY	Contrarian	Contrarian	Contrarian	Contrarian	Momentum	Momentum	Momentum	Momentum
USD/RUB	Momentum	Momentum	Contrarian	Contrarian	Contrarian	Contrarian	Contrarian	Contrarian
EUR/PLN	Momentum	Momentum	Contrarian	Contrarian	Contrarian	Contrarian	Contrarian	Contrarian
EUR/HUF	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**Contrarian**	**-**	**Contrarian**	**Contrarian**
EUR/CZK	-	-	-	-	-	-	-	-
USD/BRL	Contrarian	Contrarian	Contrarian	Contrarian	Momentum	Momentum	Momentum	Momentum
USD/MXN	Momentum	Momentum	Momentum	Momentum	Contrarian	Contrarian	Momentum	Contrarian

Source: Morgan Stanley Research; Note: Currency pairs where options positioning is a contrarian indicator in at least seven out of the eight possible scenarios are bolded and highlighted in light blue shade. EUR/CZK options positioning has never reached very long or short levels over the backtesting period.

Exhibit 110: Median forward returns when FX options positioning flags as extreme

When positioning flags…	Median Forward Returns							
	V. Short				V. Long			
After…	1 week	2 weeks	1 month	3 months	1 week	2 weeks	1 month	3 months
CCY pair								
Fed Broad USD	0.07	-0.24	-0.66	-0.02	0.02	0	0.63	-0.41
DXY	0.27	-0.24	-0.5	-0.3	-0.07	-0.45	-0.25	0.3
BBDXY	0.13	-0.35	-0.67	-0.39	-0.01	-0.12	0.42	-0.69
GBIEMFX USD	0.06	0.01	0.63	1.88	0.19	1.01	0.93	-1.05
EUR/USD	0.07	0.64	0	0.32	0	0.53	0.48	0.41
USD/JPY	0.61	0.58	0.52	0.39	-0.31	-0.41	-0.09	-0.01
GBP/USD	0.18	0.82	0.61	-0.3	-0.59	-0.65	-1.03	-0.17
USD/CHF	0.71	0.92	0.6	1.48	-0.12	-0.7	-1.23	-1.51
USD/CAD	-0.12	0.05	0.26	-0.03	-0.01	-0.29	0.53	-2.56
AUD/USD	0.36	1.02	1.4	2.16	0.15	0.1	-0.54	-1.57
NZD/USD	0.47	-0.21	-0.19	1.42	0.36	0.16	0.12	-0.52
USD/NOK	0.32	0.04	-0.34	2.34	-0.37	-0.48	-0.91	-1.71
EUR/CHF	0.04	0.16	0.21	-0.14	-0.08	0.01	0.24	0.66
EUR/SEK	-0.14	0.17	0.01	0.81	-0.47	-0.78	-0.31	-1.03
EUR/NOK	0.17	0.26	0.93	1.52	-1.02	-1.04	-0.69	-0.12
EUR/GBP	0.24	0.31	0.15	0.17	-0.36	-0.71	-0.84	-1.49
EUR/JPY	0.22	0.6	0.33	-1.04	0.02	0.49	0.23	-0.09
USD/CNY	-0.29	-0.66	-1.23	-1.87	0.26	0.67	1.18	1.97
USD/INR	0.16	0.2	0.58	0.87	0.24	0.62	0	0.12
USD/KRW	0.11	-0.57	-0.76	-0.17	0	-0.09	-0.54	-1.76
USD/SGD	-0.13	-0.19	-0.02	-0.82	0.04	-0.04	0.26	-0.4
USD/TWD	-0.18	0.56	0.56	0.46	-0.02	-0.06	-0.5	-0.94
USD/HKD	0	0.02	0.03	0.08	0.01	0	-0.02	-0.26
USD/IDR	0.12	0.28	0.78	2.79	-0.1	0.85	-0.88	-1.94
USD/PHP	-0.1	-0.23	-0.17	-0.56	0.09	0.31	0.43	0.77
USD/ZAR	0.37	1.08	3.22	0.79	0.06	-0.01	-1.02	-1.24
USD/TRY	0.31	0.54	0.75	1.81	0.62	1.11	1.46	0.79
USD/RUB	-0.15	-0.76	0.46	0.05	-1.16	-0.47	-1.43	-12.49
EUR/PLN	-0.04	-0.11	0.06	1.09	-0.26	-0.42	-0.37	-1.91
EUR/HUF	0.37	0.58	1.09	1.91	-0.06	0	-0.65	-0.19
EUR/CZK	-	-	-	-	-	-	-	-
USD/BRL	0.76	1.16	0.46	1.53	1	1.12	2.43	2.12
USD/MXN	-0.18	-0.05	-0.34	-0.13	-0.58	-0.45	0.3	-2.06

Source: Morgan Stanley Research; Note: Currency pairs where options positioning is a contrarian indicator in at least seven out of the eight possible scenarios in Exhibit 109 are bolded. EUR/CZK options positioning has never reached very long or short levels over the backtesting period.

FX options positioning scores history

We have created positioning categories for each currency pair back to 2015, a period in which we had sufficient data to calculate a historical perspective for the latest level of options positioning. Very short and very long extremes are defined as being 1.5 standard deviations away from zero since the series began. Exhibit 111 shows that USD on a broad basis has spent around 20% of the time in the extreme categories.

The USD (DXY, or broad USD) has spent most of the time (~35%) in the long category. Some may say the currencies should spend most of the time in neutral territory with an even distribution around that. We disagree, the main reason being that the currencies with high weights in both the DXY and Broad USD have generally been trending higher for most of the time since 2015. In particular versus EUR, CNY and high-beta EM currencies.

USD/JPY had the most skewed distribution within the G10, spending 35% of the time in long territory and only 20% of the time in short territory. EUR/CZK had the most skewed distribution within the EM pairs, spending 52% of the time in short territory and only 24% in long territory. EUR/CZK never reached the very long or very short extremes. We think this may be a function of the relatively low trading volumes for EUR/CZK options and/or the Czech central bank having had a currency floor in place for a period of time.

Exhibit 111: Proportion of time spent in each options positioning category

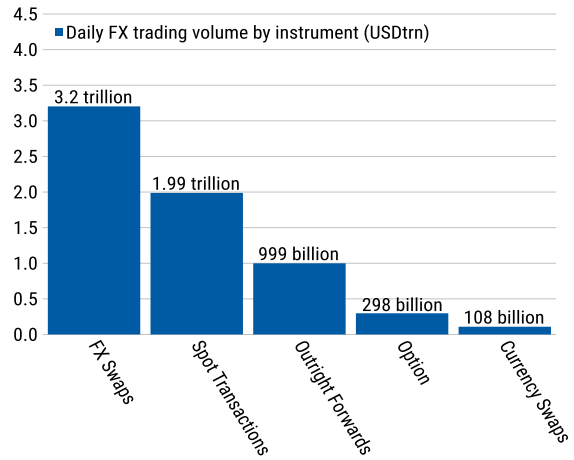
	Very short	Short	Neutral	Long	Very long
EUR/USD	11	33	27	21	6
USD/JPY	4	20	28	35	11
GBP/USD	9	28	30	26	5
USD/CHF	5	19	29	33	12
USD/NOK	8	26	25	24	14
USD/CAD	6	23	27	32	9
AUD/USD	7	32	29	24	5
NZD/USD	10	27	28	25	7
EUR/JPY	8	28	31	26	5
EUR/GBP	9	27	29	24	9
EUR/CHF	8	20	26	30	13
EUR/SEK	10	30	27	25	5
EUR/NOK	14	40	23	17	4
USD/CNY	4	31	32	29	1
USD/HKD	0	19	31	47	1
USD/SGD	1	23	30	28	14
USD/MXN	9	36	23	22	7
USD/ZAR	5	24	31	27	10
USD/TRY	4	27	24	31	12
USD/RUB	3	41	30	20	3
EUR/PLN	9	33	33	17	7
EUR/CZK	0	51	23	24	0
EUR/HUF	7	21	29	28	13
USD/BRL	5	29	31	24	8
USD/KRW	5	19	29	35	10
USD/INR	11	36	29	15	7
USD/TWD	0	15	35	35	13
USD/PHP	8	32	28	24	5
USD/IDR	2	37	31	25	3
DXY	5	21	28	34	11
BBDXY	6	21	28	35	8
Fed Broad USD	9	22	26	29	12
GBIEMFX USD	7	31	35	17	8

Source: Morgan Stanley Research

Size of the FX options market

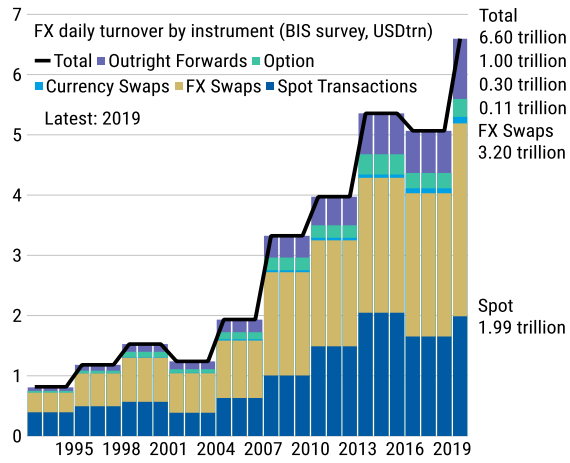
The FX options market traded around US$300 billion worth of notional in a day in 2019, but volumes are small compared to the size of the spot market, which trades over six times the volume a day (around US$2 trillion), as shown in Exhibit 112. We do not think that the relatively smaller size of the options market versus spot means the positioning information is not important. The small volumes in options markets could be a result of options traders using the spot markets to hedge their positions, and many FX participants are unable to use derivatives so use forwards or spot instead.

Exhibit 112: Daily FX trading volume by instrument – options market around US$300 billion/day versus US$2 trillion for spot



Source: Macrobond, Morgan Stanley Research

Exhibit 113: Daily FX trading volume by instrument over time (from the BIS survey)



Source: Macrobond, Morgan Stanley Research

Data FAQ

How far back do the data go?

Options trading data are available from mid-2013, but reliable data only started in October 2013. Using a 3-month lookback window for the calculation, we have the positioning score starting from 2014.

How frequent are the data?

The options traded data are updated intraday, but we are screening on a daily basis using UTC time. All time series charts are showing a calculated net options positioning score for that day.

Which currencies do you have positioning scores for?

The list of currency pairs is shown in Exhibit 11. Data are available for other currency pairs, but we excluded those that didn't have a sufficient volume traded each day. For many of the G10 pairs, we have USD and EUR cross-positioning scores.

What proportion of the options market does this data capture?

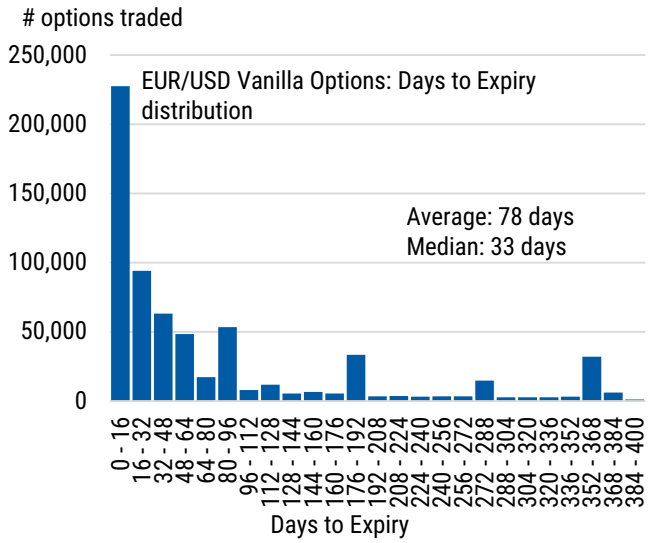
We make some approximations to estimate the proportion of the options market our data capture. See Exhibit 39, in which each bar shows an individual currency's volume of vanilla options traded in 2020 from the DTCC data set as a proportion of estimated

annual FX options traded in the market, using BIS daily trading volume data from 2019. The proportion of the market captured varies by currency, with USD/CAD the highest, at over 40%, and EUR/HUF the lowest, at under 10%.

What is the average tenor of options traded?

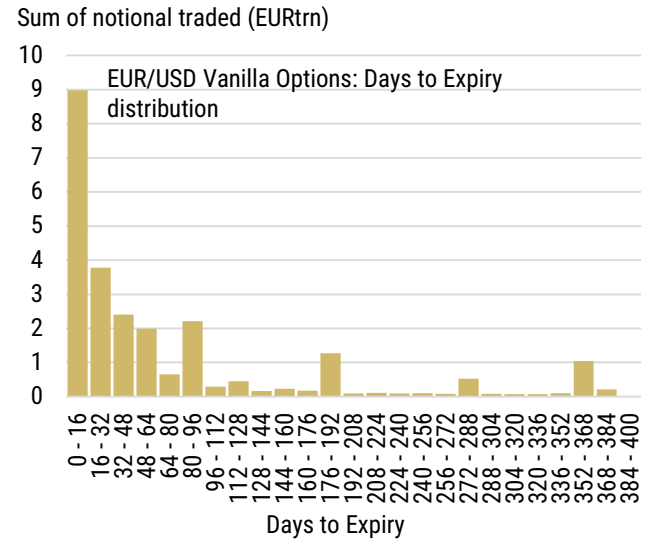
Exhibit 114 shows that EUR/USD options captured in our whole data sample have an average maturity of 78 days (around three months) and a median maturity of 33 days (around a month). This is the case regardless of whether we look at the absolute number of options traded or the total notional traded.

Exhibit 114: EUR/USD options expiry – median expiry around one month



Source: DTCC, Morgan Stanley Research; Note: For the average calculation we remove the top 5% of days to expiry to account for large outliers.

Exhibit 115: EUR/USD traded notional by option expiry date



Source: DTCC, Morgan Stanley Research.

USD aggregate index weights

USD positioning is calculated in a variety of ways based on the most commonly used USD indices. Below are the weights we use in our USD positioning estimates, taking out the currencies where options data are unavailable.

Exhibit 116: DXY USD positioning currency weights (%)

DXY		
CCY pair	Initial weight	New weight
EUR/USD	57.6	60.1
USD/JPY	13.6	14.2
GBP/USD	11.9	12.4
USD/CAD	9.1	9.5
USD/CHF	3.6	3.8
~~USD/SEK~~	~~4.2~~	0.0

Source: Morgan Stanley Research

Exhibit 117: Fed Broad USD positioning currency weights (%)

Fed Broad USD		
CCY pair	Initial weight	New weight
EUR/USD	20.1	21.8
USD/CNH	13.7	14.9
USD/MXN	13.7	14.9
USD/CAD	13.3	14.5
USD/JPY	6.4	6.9
GBP/USD	5.4	5.9
USD/KRW	3.3	3.6
USD/INR	2.9	3.1
USD/CHF	2.8	3.1
USD/TWD	2.1	2.3
USD/BRL	1.9	2.1
USD/SGD	1.9	2.1
AUD/USD	1.4	1.5
USD/HKD	1.3	1.4
USD/IDR	0.7	0.7
USD/PHP	0.7	0.7
USD/RUB	0.5	0.5
~~USD/ARS~~	~~0.4~~	0.0
~~USD/CLP~~	~~0.6~~	0.0
~~USD/COP~~	~~0.6~~	0.0
~~USD/ILS~~	~~1.0~~	0.0
~~USD/MYR~~	~~1.3~~	0.0
~~USD/AED~~	~~0.5~~	0.0
~~USD/SEK~~	~~0.6~~	0.0
~~USD/THB~~	~~1.1~~	0.0
~~USD/VND~~	~~1.8~~	0.0

Source: Morgan Stanley Research

Exhibit 118: Bloomberg DXY USD positioning currency weights (%)

Bloomberg DXY	
CCY pair	Weight
EUR/USD	32.7
USD/JPY	14.6
USD/CAD	11.9
GBPUSD	11.5
USD/MXN	10.0
AUD/USD	5.2
USD/CHF	4.8
USD/KRW	3.4
USD/CNY	3.0
USD/INR	3.0

Source: Morgan Stanley Research

Exhibit 119: GBI-EM-weighted USD positioning currency weights (%)

GBIEM-FX USD		
CCY pair	Initial weight	New weight
USD/CNY	10.0	18.5
USD/IDR	9.4	17.3
USD/MXN	9.4	17.3
USD/BRL	8.2	15.1
USD/ZAR	7.6	14.0
USD/RUB	7.2	13.3
USD/TRY	2.3	4.2
USD/PHP	0.1	0.2
~~USD/CZK~~	~~4~~	0.0
~~USD/COP~~	~~5.2~~	0.0
~~USD/HUF~~	~~4~~	0.0
~~USD/MYR~~	~~7.2~~	0.0
~~USD/PEN~~	~~2.6~~	0.0
~~USD/PLN~~	~~8.3~~	0.0
~~USD/THB~~	~~8.6~~	0.0
~~USD/CLP~~	~~2.5~~	0.0

Source: Morgan Stanley Research

Global Macro Strategy Team

MORGAN STANLEY & CO. LLC	**Matthew Hornbach** Matthew.Hornbach@morganstanley.com	Global Head of Macro Strategy	+1 212 761-1837
	Guneet Dhingra, CFA Guneet.Dhingra@morganstanley.com	Head of US Interest Rate Strategy	+1 212 761-1445
	Edward von der Schmidt, CFA	US Interest Rate Strategist	+1 212 761-7085
	Kelcie Gerson	US Interest Rate Strategist	+1 212 761-3983
	David Harris	US Interest Rate Strategist	+1 212 761-0087
	Henry Steck	US Interest Rate Strategist	+1 212 761-3168
	David Adams, CFA David.Adams@morganstanley.com	Head of G10 FX Strategy, North America	+1 212 761-1481
	Andrew Watrous	G10 FX Strategist	+1 212 761-5287
	Simon Waever Simon.Waever@morganstanley.com	Global Co-Head of EM Sovereign Credit Strategy	+1 212 296-8101
	Andres Jaime Andres.Jaime@morganstanley.com	Head of Latam Macro Strategy	+1 212 296-5563
	Ioana Zamfir	Latam Macro Strategist	+1 212 761-4012
	Gilberto Hernandez-Gomez	Latam Macro Strategist	+1 212 296-8940
MORGAN STANLEY & CO. INTERNATIONAL PLC	**James K. Lord** James.Lord@morganstanley.com	Global Head of FXEM Strategy	+44 20 7677-3254
	Alina Zaytseva	European Interest Rate Strategist	+44 20 7677-1120
	Lorenzo Testa	European Interest Rate Strategist	+44 20 7677-0337
	Sheena Shah Sheena.Shah@morganstanley.com	Head of G10 FX Strategy, Europe	+44 20 7677-6457
	Gek Teng Khoo	G10 FX Strategist	+44 20 7425-3842
	John Kalamaras	G10 FX Strategist	+44 20 7677-2969
	Pascal Bode	EM Sovereign Credit Strategist	+44 20 7425-3282
	Filip Denchev	CEE Macro Strategist	+44 20 7677-3166
MORGAN STANLEY ASIA LIMITED+	**Min Dai** Min.Dai@morganstanley.com	Head of AXJ Macro Strategy	+852 2239-7983
	Belle Chang	AXJ Macro Strategist	+852 3963-0668
	Jingzhong Zhang	AXJ Macro Strategist	+852 2239-1528
MORGAN STANLEY MUFG SECURITIES CO., LTD.	**Koichi Sugisaki** Koichi.Sugisaki@morganstanley.com	Head of Japan Macro Strategy	+81 3 6836-8428
	Shoki Omori	Japan Macro Strategist	+81 3 6836-5466

Endnotes

1 More detailed explanations of the different performance metrics: Calmar ratio; Omega ratio; Sortino ratio; Tail ratio: Determines the ratio between the right (95%) and left tail (5%) of the returns distribution). For example, a ratio of 0.25 means that losses are four times as bad as profits; Stability: Determines the R-squared of a linear fit to the cumulative log returns.

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Not-Rated/Hold	**1**	**0%**	**0**	**0%**	**0%**	**0**	**0%**
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TOTAL	**3,506**		**870**			**1527**	

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