

Trading short-term mean reversion in FX

Examples based on the IMM report and short-term fair value models

- In 2012, we released the *Daily FX Alpha Chartpack* covering several rule-based trading models and positioning proxies.
- To this suite of rule-based models, we add two additional signals that we regularly use in our publications to inform our trade recommendations: (1) the weekly IMM non-commercial positions data, and (2) the mispricing on *J.P. Morgan's FX Fair Value Regressions Report*. With both, positioning and valuations, at an extreme for select currencies, it is worthwhile assessing if there is value in mean reversion strategies based on these metrics.
- We track IMM positions in the *Weekly IMM Chartpack*. The new addition to the Alpha pack records returns from using historical extremes of IMM positions as contrarian signals. Returns are generally modest – success ratios for individual currencies vary between 30% - 60%, and Sharpe ratio of a systematic IMM-based mean-reversion basket is ~0.3. Still, it serves as a useful style benchmark for contrarian investing in FX, informs whether trend-following or contrarian styles are in vogue, and offers limited upside but low-correlation diversification against carry and momentum.
- The mispricing relative to cyclical variables is available daily by currency pair in the *FX Fair Value Regressions Report*. We find that this mispricing is a useful signal of future returns and that a pair-wise strategy of buying (selling) the cross when it is 1.5 sigma or more below (above) fair value on our short-term fair value models and holding the trade till the mispricing had been reduced to 1 sigma has historically yielded the best results.
- The strategy has a high hit rate and a positive (albeit modest) P/L on average across currencies (average annual returns of 2.5% with IR of 0.44 over last 5-years), but works better with USD pairs (68% average hit rate) than non-USD pairs. The rule has historically worked best for GBP/USD, AUD/USD, USD/SEK and USD/NOK and typically performs well in periods characterized by low vol.
- Results of both strategies are refreshed daily in the *FX Alpha Chartpack*.

Global FX Strategy

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See page 10 for analyst certification and important disclosures.

Background

In 2012, we had released the **Daily FX Alpha Chartpack** comprising seven reports covering rule-based trading models and positioning proxies used by the Global FX Strategy team in prior years. The rule-based models included were global FX carry, interest rate momentum, carry plus rate momentum, spot momentum plus rate momentum and spot mean reversion¹. The report is generated on a daily basis and is available to clients on www.jpmorganmarkets.com under **Global FX Strategy | Daily/Weekly Cash FX Analytics** (Figure 1). Page one in the report summarizes the performance of all the models and starting page two, additional details for each strategy are provided with a single page dedicated to each model.

To this suite of rule-based models, we add two additional signals that we have regularly used in our publications to inform our trade recommendations. First, we incorporate the weekly **IMM non-commercial positions** data as a contrarian signal of FX returns. This model builds on our previous work on backtesting this signal. Second, we add the mispricing on **J.P. Morgan's FX Fair Value Regressions Report**² as a signal of FX returns. This is a daily report that was introduced alongside the **FX Alpha Chartpack** in 2012 and relates FX crosses to other high-frequency drivers of valuations such as rate differentials, volatility and commodity prices, and estimates the magnitude by which FX markets are dislocated from these variables. Together, IMM and short-term fair value introduce a mean-reversion /contrarian risk factor into our suite of alpha models that has so far been heavy on carry and momentum, and helps complete the carry-value-momentum trifecta common to quant-investing approaches in other asset classes. The details of both models are discussed below.

Contrarian trading using IMM positions

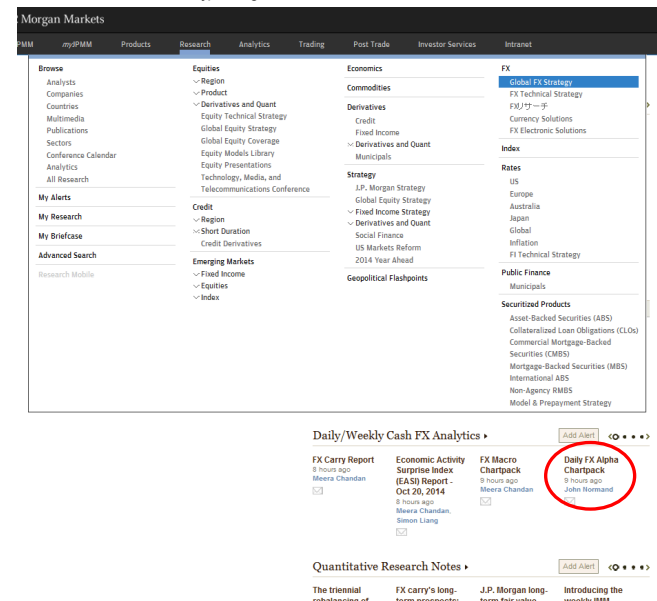
IMM positions represent the net currency positions of non-commercial accounts on the Chicago Mercantile Exchange. Despite exchange traded FX volumes being only a miniscule fraction of overall FX market turnover (less than 5% by BIS estimates) and the CME data itself being three days stale (released on Fridays for positions as of Tuesday), the non-commercial series are closely followed by currency market participants since they are considered to be indicative of short-term speculative investor positioning and correlate reasonably well with exchange rate moves (for detailed positioning statistics and pair-by-pair plots of spot moves vs. IMM positions, refer to [J.P. Morgan Weekly IMM Chartpack](#)).

¹ [Introducing Daily FX Strategy Analytics](#)

² Also available daily on www.jpmorganmarkets.com under **Global FX Strategy | Daily/Weekly Cash FX Analytics**

Figure 1: Accessing the **Daily FX Alpha Chartpack**

Screenshot from www.jpmorganmarkets.com



Source: J.P. Morgan

Chart 1: IMM-based contrarian investing in FX has been mildly profitable, but with low Sharpe ratios and large drawdowns

Trading rule buys the most oversold currency and sells the most overbought currency in the basket of 9 currencies every week based on 1-yr Z-score of IMM positions, with no constraints on z-score threshold for assuming long/short positions.



Source: J.P. Morgan

The new IMM report tracks returns from contrarian investing conditioned on extremes of IMM positioning. Attempts to pinpoint turning points in currencies by fading extremes in spec positions is not a novel idea. Previous JPMorgan research³ on the issue had introduced a z-score based signal for flagging currencies where extreme length could be a precursor to meaningful reversals; we update

³ [Introducing the weekly IMM chartpack and signaling model](#)

those results here with a wider set of currencies for which CFTC has started making position data available in recent years, and a more comprehensive model backtest.

The model involves three parameters: (a) the historical window over which positioning z-scores are calculated, (b) the threshold z-score at which long/short signals are triggered and (c) the number of currencies in the trading basket. As a baseline case, consider a weekly model that buys the currency with the lowest 52-week z-score of IMM positions among a panel of 9 currencies, and sells the one with the highest z-score, without any minimum z-thresholds for signal activation. Chart 1 plots total returns from such a heuristic over the last 12 years, with buy/sell signals rebalanced every week as new CFTC data is released. Returns are positive on average but not stellar on a risk-adjusted basis: since 2002, the strategy has generated 4.7% annually with an information ratio of about 0.3. As a robustness check, table 1 displays the results of shocking the three key parameters of the baseline model one at a time, holding the others constant. Alternative z-score windows and basket sizes do not improve return statistics, but tail losses can be reduced by using a 1-sigma threshold for activating trades, at the cost of a lower information ratio however. In our view, the very notion of using extreme positions as a contrarian indicator makes a z-score threshold intuitive to apply, hence this trade-off is acceptable to us. As a result, the version of the trading rule that we track in the chartpack buys the most oversold currency and sells the most overbought, *subject to the restriction that 52-week IMM z-scores in both cases satisfy the 1-sigma threshold*. If the latter condition is not met, over-bought/sold conditions are considered absent and no positions are held in the strategy basket that week.

In addition to returns across a basket of currencies, the IMM report also displays current IMM z-scores and contrarian trading return statistics on a pair-by-pair basis (table 2), which can be useful to investors interested only in specific currencies. **The success rate of calling mean-reversion of crowded trades for individual currencies is between 30%-60% over a 1-month holding horizon;** the table highlights entries where success ratios over different sample periods have been better than 50-50 coin flips. The most liquid G10 currencies – EUR, JPY, GBP and CHF – where price discovery is the most efficient and cross-currents between economic and speculative flows the strongest also have the poorest track record of predictability using a simple positioning signal. In contrast, **IMMs have done a reasonable job of flagging extremes in commodity FX** (hit rates for AUD, NZD, CAD all around 60%). Extreme dollar longs are currently the most obvious outlier in the table, but the poor success rate of fading DXY based on extreme dollar length should caution against swimming against the tide of a once-in-twenty-years

Table 1: Robustness check of IMM model performance using various combinations of historical z-score windows, z-score thresholds and basket constituents

Baseline (52-week lookback, 1 long vs. 1 short, 0 threshold)

Avg. ret	IR	1%-ile loss	Sortino Ratio
4.7%	0.32	-5.0%	0.38

Lookback windows, weeks (1 long vs. 1 short, 0 threshold)

# of weeks	Avg. ret	IR	1%-ile weekly loss	Sortino Ratio
13	2.1%	0.15	-4.8%	0.18
26	2.6%	0.18	-4.9%	0.22
39	4.0%	0.27	-4.7%	0.32
52	4.7%	0.32	-5.0%	0.38
104	3.7%	0.25	-4.4%	0.28
156	2.6%	0.19	-4.0%	0.24

of basket constituents (52-week lookback, 0 threshold)

# of longs = # of shorts	Avg. ret	IR	1%-ile weekly loss	Sortino Ratio
1	4.7%	0.32	-5.0%	0.38
2	-0.1%	-0.01	-3.7%	-0.01
3	-1.0%	-0.10	-3.6%	-0.11

Sigma Thresholds (52-week lookback, max 1 long vs. max 1 short basket)

Sigma threshold	Avg. ret	IR	1%-ile weekly loss	Sortino Ratio
0.0	4.7%	0.32	-5.0%	0.38
1.0	2.3%	0.18	-4.7%	0.22
2.0	-2.4%	-0.25	-3.7%	-0.20
3.0	1.2%	0.51	-0.9%	0.26

Source: J.P. Morgan

Table 2: Pair-by-pair backtests of contrarian trading in currencies from pre-determined thresholds of IMM positioning

The table below shows backtest results for a simple contrarian rule using IMM data. A long/short position in the currency is initiated if the IMM position exceeds a pre-determined threshold level (one standard deviation) around a 52-week trend

		1-mo holding period (1-sigma threshold)											
		EUR	JPY	GBP	CHF	CAD	AUD	NZD	MXN	BRL	RUB	Gold	DXY
Current 1-yr z-score of IMM position		-1.30	0.27	-2.26	-0.28	-0.40	-1.16	-1.23	-1.21	0.26	1.96	2.16	1.42
1999- Return		BUY	BUY	BUY	BUY	BUY	BUY	BUY	BUY	SELL	SELL	SELL	
Pre- Info. Ratio		-3.3%	-0.3%	0.4%	0.7%	-1.6%	0.3%	-2.3%	-0.7%	-0.9%	-2.2%	-1.0%	-1.7%
sent Success Rate		42%	50%	53%	49%	46%	50%	43%	48%	44%	50%	36%	38%
# of Trades		417	344	410	377	377	391	280	445	108	152	130	149
Last 5 Return		-6.0%	-1.6%	-0.3%	-1.5%	1.4%	4.3%	4.9%	-0.7%	-0.9%	-2.8%	-3.9%	-1.9%
years Info. Ratio		-0.2	-0.1	0.0	-0.1	0.1	0.2	0.2	0.0	0.0	0.0	-0.1	-0.1
Success Rate		31%	46%	46%	42%	56%	59%	60%	49%	44%	53%	30%	42%
# of Trades		150	96	156	142	110	121	121	140	108	128	108	72
Last 2 Return		-5.3%	-2.9%	-4.8%	-0.9%	-0.9%	1.1%	3.7%	-1.8%	1.3%	-2.8%	5.7%	0.0%
years Info. Ratio		-0.3	-0.1	-0.3	0.0	-0.1	0.0	0.2	-0.1	0.0	-0.1	0.2	0.0
Success Rate		26%	40%	32%	42%	49%	56%	58%	56%	45%	58%	35%	0%
# of Trades		54	35	69	55	39	50	55	64	62	43	48	0

Source: J.P. Morgan

monetary policy divergence in G4.

On the whole, risk-adjusted returns to mean-reversion in FX are mediocre, which probably explains the proliferation of short-term momentum rather than contrarian traders in the currency market. Nonetheless, the simple IMM strategy outlined here serves as a useful 'style benchmark' for contrarian investing in FX. Also, since up- and down-cycles in style returns tend to persist – note the multi-year swings in strategy P/Ls in chart 1 – regime switches between the two are of particular interest, even for discretionary investors who can shade their views on trend-following vis-à-vis mean-reversion approaches accordingly. Finally, low/mildly negative correlations with other alpha strategies (table 3) suggests that there is some value in incorporating mean-reversion as a risk factor in currency portfolios alongside carry and momentum.

Using mispricing on J.P. Morgan's FX Fair Value Regressions as a signal for future returns

J.P. Morgan introduced the **Daily FX Fair Value Regressions Report** in 2012 alongside the release of the *FX Alpha Chartpack*⁴. The report comprises a series of fair value models for multiple currencies, in which the spot is linked to several cyclical variables to determine if the FX is rich or cheap. Each slide in the chartpack presents daily results for a currency pair regressed versus various cyclical variables such as short-term interest rate spreads, commodity prices, VIX and sovereign spreads over several sample periods. The mispricing for each pair is then summarized on the first two pages of the report to provide a top-down perspective on the richest and cheapest pairs in the universe. The report is available to clients on www.jpmorganmarkets.com under **Global FX Strategy | Daily/Weekly Cash FX Analytics**.

The following question then arises: **are substantial mispricings on such short-term fair value models a good signal for future FX returns?** To answer this question, we undertook a variety of backtesting exercises ranging from a cross-sectional strategy which involved buying/ selling the most mispriced pairs in our universe, to a pair-wise strategy based on z-score thresholds for each pair (such as buying (selling) EUR/USD if the currency is 1.5 sigma or more below (above) fair value). Multiple initiation thresholds (1, 1.5 and 2 sigma) were tested, as were several holding periods ranging from fixed holding periods (2-weeks to 2-months) to flexible holding periods (i.e. holding the trade till the mispricing faded). The strategy was tested separately for USD and non-USD pairs, as well as our currency universe as a whole.

Table 3: Monthly return correlations between benchmark IMM-based contrarian model and other alpha strategies

Monthly data since April 2002

	G10 Carry	EM Carry	Global carry	USD/G10 rate momentum	Carry with rate momentum overlay	Spot momentum	Spot momentum with rate momentum overlay	IMM
G10 Carry	1.00	0.51	0.84	(0.04)	0.69	0.08	0.10	0.05
EM Carry		1.00	0.73	(0.02)	0.48	(0.16)	(0.11)	0.25
Global carry			1.00	0.08	0.71	(0.04)	0.04	0.19
USD/G10 rate momentum				1.00	0.25	0.13	0.41	(0.04)
Carry with rate momentum overlay					1.00	0.09	0.25	(0.06)
Spot momentum						1.00	0.79	(0.23)
Spot momentum with rate momentum overlay							1.00	(0.25)
IMM								1.00

Source: J.P. Morgan

Table 4: Higher initiation thresholds and flexible holding periods yields better returns

Average returns per trade and hit rates across pair-types for select initiation thresholds (1, 1.5, 2 z-score mispricing) and different holding periods of trades (fixed and till mispricing corrects*)

Initiation sigma threshold	All pairs				USD pairs only			
	Holding period of trade				Holding period of trade			
	2w	1m	2m	Till mispricing corrects*	2w	1m	2m	Till mispricing corrects*
Returns; %								
1	0.0	0.0	0.1	0.1	-0.1	-0.2	-0.3	0.2
1.5	-0.1	-0.1	0.1	0.1	0.1	0.2	0.3	0.2
2	0.0	0.2	0.4	0.0	0.3	0.5	0.3	0.2
Hit rates								
1	51%	49%	49%	62%	48%	49%	45%	65%
1.5	50%	50%	53%	61%	50%	53%	54%	67%
2	50%	52%	57%	57%	56%	60%	59%	69%

* Assumes trade is held till z-score mispricing returns to below the initiation threshold, i.e. initiation and unwind thresholds are the same. All results based on 5-year history and use 1y z-scores of 1y residuals as a signal. Source: J.P. Morgan

Table 5: Lowering the unwind thresholds and using 1-year residuals improves performance

Average returns per trade hit rates across all pair-types for select initiation and unwind thresholds assuming trades are held till mispricing corrects*

Initiation threshold	1y residuals		2y residuals		1y minus 2y	
	Unwind z-score threshold*					
	0.5	1	0.5	1	0.5	1
Holding period returns; %						
1	0.2	0.1	0.1	0.1	0.0	0.0
1.5	0.2	0.2	0.1	0.1	0.1	0.1
2	0.2	0.3	-0.2	0.0	0.4	0.3
Hit rates						
1	62%	62%	62%	63%	0%	-1%
1.5	62%	63%	61%	63%	1%	0%
2	62%	63%	54%	62%	8%	1%

* Assumes trades are initiated when 1y or 2y residuals z-score is 1, 1.5 and 2 sigma mispriced and held till z-score mispricing returns to 0.5 and 1 sigma. All results based on 5-year history. Source: J.P. Morgan

⁴ [Introducing Daily FX Strategy Analytics](#)

Based on these backtests, **we found that a pair-wise strategy of buying (selling) the cross when it was 1.5 sigma or more below (above) fair value on our short-term fair value models and holding the trade till the mispricing had been reduced to 1 sigma yielded the best results.** The specific signal we found the most value in is the 1-year rolling z-score of the residual from the 1-year fair value model. To summarize the results, while the average overall returns from this strategy are relatively modest (the strategy has yielded average annual returns of 2.5% and IR of 0.44 over the last 5-years), the pair-wise dispersion of returns and hit rates is quite high indicating that the strategy works well for select pairs (GBP/USD, AUD/USD, USD/SEK and USD/NOK). The following observations may be made based on this exercise.

First, **a higher initiation z-score threshold typically yields better results** with higher average returns per trade and higher hit rates for the same holding period. Table 4 summarizes the backtest results from using this signal and compares the results for different initiation thresholds (1, 1.5 and 2 z-score; first column). The results are shown separately for USD and non-USD pairs. As shown in the table, holding period returns for USD pairs averaged -0.1% per trade if the trades were initiated at z-score of 1.0 vs. 0.3% if the trades were initiated at z-score of 2.0 for a fixed 2-week holding period. This was the case across most holding period horizons examined.

Second, **using flexible holding periods has been a better strategy than using fixed holding periods** in aggregate. Table 4 also shows the performance of the strategy for different holding periods (either fixed at 2-weeks, 1-month and 2-months, or flexible holding periods till mispricing corrects to below the initiation z-score threshold of 1, 1.5 and 2). While the average returns per trade are lower for the strategy of holding trades till mispricing corrects, it is noteworthy that hit rates are significantly higher (67% on average for USD pairs) than the strategy of holding the trade for fixed periods ranging from 2-weeks to 2-months (53% on average for USD pairs) suggesting that there is value in this approach. Tweaking the strategy by implementing different unwind thresholds improves the returns from this approach. Table 5 shows the impact of lowering unwind thresholds to 0.5 and 1 z-score (across columns) and indicates that **lowering the unwind threshold to 1.0 sigma improves the returns per trade**, but lowering it further to 0.5 sigma does not impact results significantly.

Third, **using 1-year residuals yields marginally better results than using 2-year residuals.** As also shown in table 5, average returns per trade and hit rates are modestly higher when 1-year residuals from the short-term fair value model are used as the signal.

Table 6: The strategy yields positive returns and hit rates > 50% for most currency pairs; results are stronger for USD pairs

Summary of backtesting results based on 5-year history

Currency	P/L (%; avg per trade)	Info Ratio	Success Rate	Avg. Holding Period***
EURUSD	0.16	0.15	71%	10
USDJPY	-0.37	-0.17	82%	14
GBPUSD	0.63	0.49	73%	14
AUDUSD	0.37	0.19	70%	14
NZDUSD	0.01	0.01	58%	13
USDSEK	0.95	0.55	84%	18
USDNOK	1.21	0.45	74%	18
USDCHF	-0.27	-0.13	65%	34
USDCAD	-0.05	-0.04	52%	13
EURGBP	0.25	0.23	65%	23
EURNOK	0.54	0.35	81%	9
EURSEK	0.53	0.58	81%	10
EURCHF	0.4	1.31	66%	12
AUDNZD	-0.01	-0.01	50%	15
NOKSEK	0.08	0.06	30%	10
EURJPY	-0.43	-0.18	55%	18
EURAUD	0.16	0.08	66%	15
EURNZD	0.38	0.27	70%	10
EURCAD	0.18	0.15	72%	9
GBPCHE	0.36	0.28	73%	23
GBPJPY	0.48	0.2	69%	34
GBPAUD	-0.75	-0.35	38%	18
GBPNZD	0.1	0.05	67%	14
GBPCAD	0.2	0.14	61%	15
GBPSEK	0.12	0.07	42%	21
AUDCAD	-0.08	-0.05	53%	15
AUDJPY	-0.08	-0.05	30%	8
NZDJPY	0.02	0.01	32%	14
NZDCAD	0.27	0.13	60%	18
Average				
USD pairs	0.29	0.17	70%	16
Non-USD pairs	0.14	0.16	58%	16
All pairs	0.18	0.16	62%	16

Source: J.P. Morgan

Hence we use the 1-year z-score of 1-year residuals as our backtest signal, and assume a trade is initiated when the z-score crosses a threshold of 1.5 and then held till it reverts to below 1.0. **This strategy has a high hit rate and a positive P/L on average across pairs**, indicating that the residuals from these models add value and are worth tracking. In aggregate, the strategy exhibits a hit rate greater than 50% in 23 out of the 29 pairs observed (i.e. 79% of the

pairs) and a positive P/L on average for 21 out of the 29 pairs (72% of the pairs in our universe).

The performance of the strategy varies substantially across pairs. In particular, **USD pairs exhibit better performance than non-USD pairs** with higher P/Ls and hit rates on average (table 6). Most USD pairs have a positive P/L, all have hit rates greater than 50% and the average hit rate for USD pairs is 12%pts higher than non-USD pairs. There is significant dispersion in performance of the trading rule even within USD pairs. For instance, **the rule has resulted in relatively larger returns for GBP/USD, AUD/USD, USD/SEK and USD/NOK**. The returns adjusted for vol are also the highest for these currencies among all pairs (column 3 in table 4), although at near 0.5 sigma are not massive on a risk-adjusted basis. This is not surprising since this rule captures only one driver of valuations, i.e. dislocation in FX markets vs. rates (primarily, among other high-frequency factors), and indeed, this dislocation could correct via a re-pricing in rates rather than in FX.

Finally, chart 2 shows the index of average daily returns per trade identified by this trading rule. It shows that over the past five years the returns from this strategy have been positive (average annual returns of 2.5% with IR of 0.44), albeit with considerable intra-period variation. Notably, **the returns from this strategy vary inversely with changes in volatility**, with an increase in FX vol resulting in lower returns as dislocations typically persist for longer and often worsen in a rising vol environment (chart 3). However, as market conditions eventually normalize and vol declines, such dislocations correct making this strategy yield positive returns.

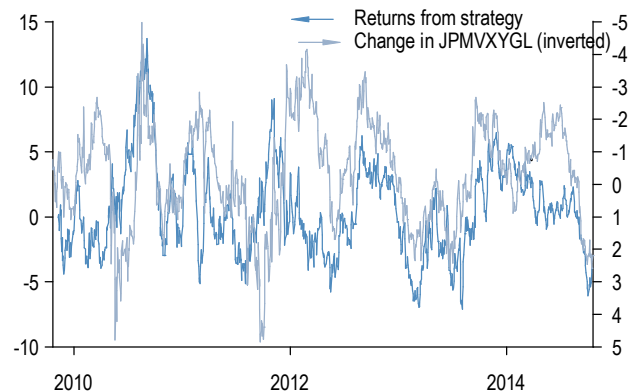
The performance statistics from this strategy are refreshed daily in two sections of the *FX Alpha Chartpack*. Its performance is listed on the very first page under 'Mean Reversion' separately for USD and non-USD pairs. In addition, page 10 of the report presents detailed performance statistics of this strategy by pair (as in table 6) and the overall performance of the strategy (as in chart 2). In addition, this slide also charts **aggregate dislocation metrics for FX**, which should be interpreted as the mispricing in currency markets on average based on these models. It is calculated as the daily cross-sectional average of absolute z-score mispricings across FX in these short-term fair value models (also shown in chart 4). A higher number for this measure suggests larger FX dislocations on these models and hence more opportunities to apply this strategy for informing trading decisions.

Chart 2: An index of daily total returns from this strategy



Chart 3: Returns from the strategy vary inversely with changes in volatility

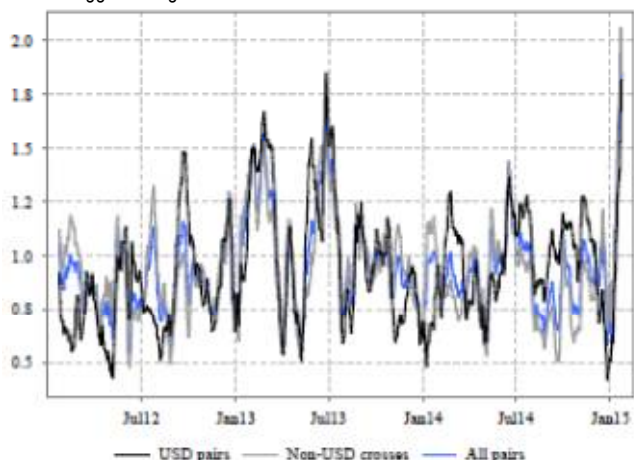
3-month rolling returns from this strategy (%) vs. 3-month change in JPMVXYGL (points)



Source: J.P. Morgan

Chart 4: A dislocation metric for FX markets

Calculated as the daily cross-sectional average of absolute value of z-score mispricing across pairs on JPM short-term fair value models. A higher number suggests larger FX dislocations.



Source: J.P. Morgan

Appendix: Sample reports from the Alpha Chartpack

Global FX Strategy

Daily FX Alpha Chartpack: model summary and fund manager performance

See the last three slides of this chartpack for brief explanatory notes on these models and indicators. The product note "Introducing Daily FX Strategy Analytics" pub discusses the methodology in more detail.

Current FX alpha model signals and recent performance

Strategy	Current Basket
Carry	
G10 carry	AUD vs. USD; CAD vs. USD; GBP vs. EUR; NZD vs. USD
EM carry	CNH vs. USD; INR vs. USD; PEN vs. USD; THB vs. USD
Global carry	AUD vs. USD; NZD vs. USD; PEN vs. USD; THB vs. USD
Momentum	
G-10 Interest rate momentum (USD pairs)	Long USD vs CHF; SEK; CAD; NOK; EUR; GBP and NZD Short USD vs JPY AUD
G-10 Interest rate momentum (EUR crosses)	Long EUR vs CHF; GBP; NOK and SEK Short EUR vs AUD; CAD; JPY; NZD and USD
EM Interest rate momentum (USD pairs)	Long USD vs MXN; BRL; KRW; INR; TRY; ZAR; CZK; HUF and PLN Short USD vs RUB
EM Interest rate momentum (EUR crosses)	Long EUR vs BRL; KRW; INR; TRY; ZAR; HUF and PLN Short EUR vs MXN; RUB and CZK
Carry plus rate momentum	CAD vs USD; EUR vs CHF; GBP vs EUR; USD vs CHF
Spot momentum	CHF vs EUR; CHF vs USD; EUR vs NOK; EUR vs SEK; GBP vs EUR; JPY vs EUR; USD vs AUD; USD vs CAD; USD vs EUR USD vs GBP; USD vs JPY; USD vs NOK; USD vs NZD; USD vs SEK
Spot plus rate momentum	EUR vs NOK; EUR vs SEK; JPY vs EUR; USD vs CAD; USD vs CHF; USD vs EUR; USD vs GBP; USD vs NOK; USD vs NZD
Mean reversion	
IMMs	Long GBP vs USD
Short-term fair value (USD pairs)	Long EUR vs USD; USD vs AUD; SEK vs USD; USD vs CHF;
Short-term fair value (cross rates)	Long EUR vs GBP; EUR vs NOK; EUR vs CHF; AUD vs NZD; SEK vs NOK; EUR vs NZD; EUR vs CAD; GBP vs CHF; GBP vs

Current trading signals from
the mean reversion trading
strategies

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Mean reversion based on IMMs

Table below shows backtest results for a simple contrarian rule. A long/short position in the currency is initiated if the IMM position exceeds a pre-determined threshold level (one and two standard deviations) around a 12-month trend. For example if non-commercial net longs on euro versus the dollar is greater than one standard deviation of the 12-month moving average of non-commercial net EUR longs then sell EUR/USD currency pair. The tables show backtest results for a 1-month holding period using weekly 1-yr z-score signals

Pair-by-pair returns from a contrarian IMM based trading rule

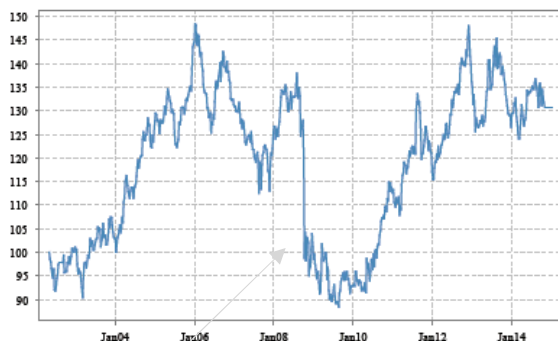
1-yr Z-scores of IMM positions for various currencies, and BUY/SELL signals

		1-mo Holding Period (1 sigma threshold)												1-mo Holding Period (2 sigma threshold)											
		EUR	JPY	GBP	CHF	CAD	AUD	NZD	MXN	BRL	RUB	Gold	DX1	EUR	JPY	GBP	CHF	CAD	AUD	NZD	MXN	BRL	RUB	Gold	DX1
Current 1-yr z-score of IMM Position		-1.19	-0.66	-2.09	-1.64	-0.04	-1.10	-1.27	-1.41	0.26	1.98	1.13	1.52	-1.19	-0.66	-2.09	-1.64	-0.04	-1.10	-1.27	-1.41	0.26	1.98	1.13	1.52
		BUY		BUY	BUY		BUY	BUY	BUY		SELL	SELL	SELL			BUY									
1999->present	Return	-3.2%	-0.3%	0.5%	0.7%	-1.6%	0.4%	-1.9%	-0.7%	-1.3%	-2.0%	-1.0%	-1.7%	-0.6%	0.4%	0.8%	-0.5%	-0.2%	-1.0%	-1.4%	-0.0%	-0.5%	-1.4%	-0.4%	-0.4%
	Info Ratio	-0.1	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	0.0	0.0	0.1	0.0	0.0	-0.1	0.0	0.0	-0.1	0.0	-0.1	
	Success Rate	42%	50%	53%	49%	46%	50%	45%	48%	44%	51%	36%	38%	42%	64%	69%	31%	48%	47%	36%	45%	58%	36%	24%	47%
	# of Trades	416	344	409	377	390	279	444	108	151	129	149		108	67	89	70	99	96	73	89	24	25	29	30
Last 5 years	Return	-6.1%	-1.6%	-0.2%	-1.7%	1.4%	4.7%	5.8%	-0.6%	-1.3%	-0.6%	-3.9%	-1.9%	-2.0%	0.2%	0.9%	-1.2%	1.1%	2.3%	1.7%	-0.7%	-0.5%	0.3%	-1.4%	0.2%
	Info Ratio	-0.2	-0.1	0.0	-0.1	0.1	0.2	0.2	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.1	0.1	0.2	-0.1	0.0	0.1	-0.1	0.0	-0.1	
	Success Rate	31%	46%	46%	42%	57%	60%	64%	50%	44%	54%	30%	42%	32%	60%	71%	21%	72%	59%	71%	41%	58%	57%	12%	73%
	# of Trades	150	97	155	142	111	121	120	140	108	127	107	72	50	25	28	24	29	37	21	27	24	14	24	15
Last 2 years	Return	-4.9%	-3.3%	-4.1%	-1.4%	-0.9%	1.9%	5.8%	-1.6%	0.6%	-2.3%	5.7%	0.0%	-2.4%	-0.4%	0.3%	-1.4%	0.5%	-2.3%	0.9%	-0.2%	-2.3%	1.2%	1.7%	0.0%
	Info Ratio	-0.3	-0.2	-0.3	-0.1	-0.1	0.1	0.3	-0.1	0.0	0.0	0.2	0.0	-0.2	-0.1	0.0	-0.2	0.1	-0.2	0.1	0.0	-0.1	0.2	0.1	0.0
	Success Rate	26%	39%	35%	41%	49%	60%	65%	59%	45%	62%	38%	0%	24%	38%	62%	0%	58%	33%	57%	44%	44%	100%	23%	0%
	# of Trades	54	36	69	56	39	50	55	64	62	42	47	0	21	8	13	5	12	18	14	9	18	5	13	0

Pair-by-pair backtest statistics

Cumulative returns from a contrarian IMM-based trading rule

Trading rule buys the most oversold currency and sells the most overbought currency every week based on 1-yr Z-score of IMM positions, subject to the condition that the absolute value of z-score is >=1. If oversold / overbought conditions do not meet the 1-sigma threshold, the strategy has no open positions that week



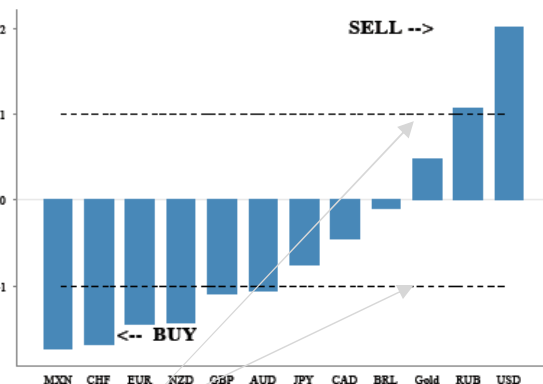
Full Sample
Avg. Ret. 2.8%
Stdev. 13.9%
IR 0.20
5%-ile weekly loss -2.7%
Sortino Ratio 0.25

Since 2013
Avg. Ret. -0.5%
Stdev. 11.3%
IR -0.05
5%-ile weekly loss -2.7%
Sortino Ratio -0.07

Performance of a trading rule that buys the most oversold currency (subject to 1-yr z-score of IMM position ≤ -1), and sells the most overbought currency every week (subject to 1-yr z-score of IMM position ≥ 1)

Trading rule return statistics

Current 1-yr Z-scores of IMM positions



1-sigma thresholds on 1-yr history of IMMs; entries below -1-sigma (oversold) are BUYS, those above +1-sigma (overbought) are SELLS

Global FX Strategy

Mean reversion based on short-term fair value models*

Currency	Resid (%)	Zscore	Signal	P/L (%) avg	Info Ratio	Success Rate	Avg. Holding Period***	# of trades
EURUSD	-9.2	-5.0	BUY	0.22	0.19	73 %	10	30
USDJPY	4.0	0.6	-	-0.37	-0.16	82 %	14	22
GBPUSD	-1.5	-0.5	-	0.63	0.47	73 %	14	22
AUDUSD	0.5	0.4	-	0.38	0.20	71 %	14	28
NZDUSD	0.1	-0.8	-	0.01	0.01	58 %	13	26
USDSEK	6.7	2.5	SELL	1.05	0.59	89 %	18	19
USDNOK	-1.0	-0.7	-	1.24	0.48	75 %	17	24
USDCHE	-16.5	-4.2	BUY	-0.27	-0.10	65 %	34	17
USDCAD	5.1	1.5	SELL	-0.05	-0.04	52 %	13	25
EURGBP	-4.9	-3.7	BUY	0.24	0.20	65 %	23	17
EURNOK	-5.6	-4.0	BUY	0.53	0.33	80 %	10	30
EURSEK	-1.7	-1.9	BUY	0.47	0.52	78 %	10	27
EURCHF	-0.6	-0.2	-	0.18	0.07	67 %	11	30
AUDNZD	-2.5	-1.5	BUY	-0.01	-0.01	50 %	15	22
NOKSEK	3.1	1.7	SELL	0.08	0.06	30 %	10	30
EURJPY	-4.9	-1.6	BUY	-0.43	-0.16	55 %	18	20
EURAUD	-3.1	-0.7	-	0.14	0.07	66 %	14	29
EURNZD	-4.7	-2.3	BUY	0.29	0.21	69 %	10	29
EURCAD	-4.1	-2.7	BUY	0.14	0.12	72 %	9	29
GBPCHF	-13.5	-5.3	BUY	0.85	0.36	77 %	23	22
GBPJPY	1.2	0.1	-	0.48	0.19	69 %	34	13
GBPAUD	0.2	-0.4	-	-0.75	-0.34	38 %	18	24
GBPNZD	-1.0	-0.3	-	0.02	0.01	64 %	14	22
GBPCAD	4.2	1.4	SELL	0.20	0.14	61 %	14	31
GBPSEK	6.7	3.3	SELL	0.12	0.07	42 %	21	12
AUDCAD	-1.1	-0.6	-	-0.08	-0.04	53 %	15	32
AUDJPY	-5.5	-2.6	BUY	-0.06	-0.04	32 %	8	38
NZDJPY	-3.4	-2.2	BUY	0.02	0.01	32 %	14	22
NZDCAD	1.7	0.2	-	0.28	0.13	57 %	19	14

	Avg P/L per trade	Avg Hit Rate		Avg returns (% annualized)	IR
Average: USD pairs	0.31 %	70.9 %	USD pairs	2.1	0.24
Average: Non-USD crosses	0.14 %	57.8 %	non-USD pairs	1.6	0.30
Average: All crosses	0.19 %	61.8 %	All pairs	2.6	0.46

Chart 1: Dislocation metric on short-term fair value models**

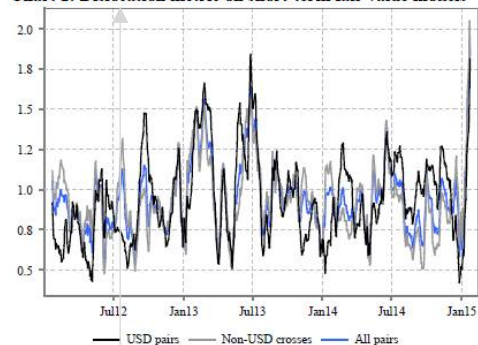
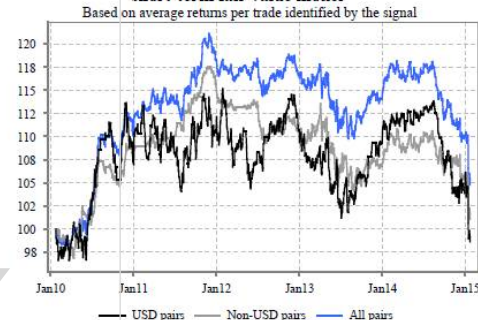


Chart 2: Performance of mean reversion strategy based on short-term fair value model



Mispricing on JPM short-term fair value models

Current buy/ sell recommendation based on the strategy

Average P/L per trade from the strategy and % that were profitable; 5y

Summary of historical performance of strategy

Measure of dislocations in JPM short-term fair value models; a higher number suggests larger number of dislocations and thus more trading signals

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