In Focus: Trading Momentum in FX Flows

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- In this article we explore ways of extracting systematic trading signals from the CitiFX Global Flow data. In particular, we show that trading momentum in hedge fund flows or the difference between hedge fund and real money flows has historically been profitable in G10 currencies.
- We also show that flow momentum can be used to make dynamic portfolio allocations in risk premia strategies. Cutting or under-weighting strategies that have seen lack of appetite from hedge funds has out-performed a passive strategy portfolio, especially on risk metrics.

Introduction

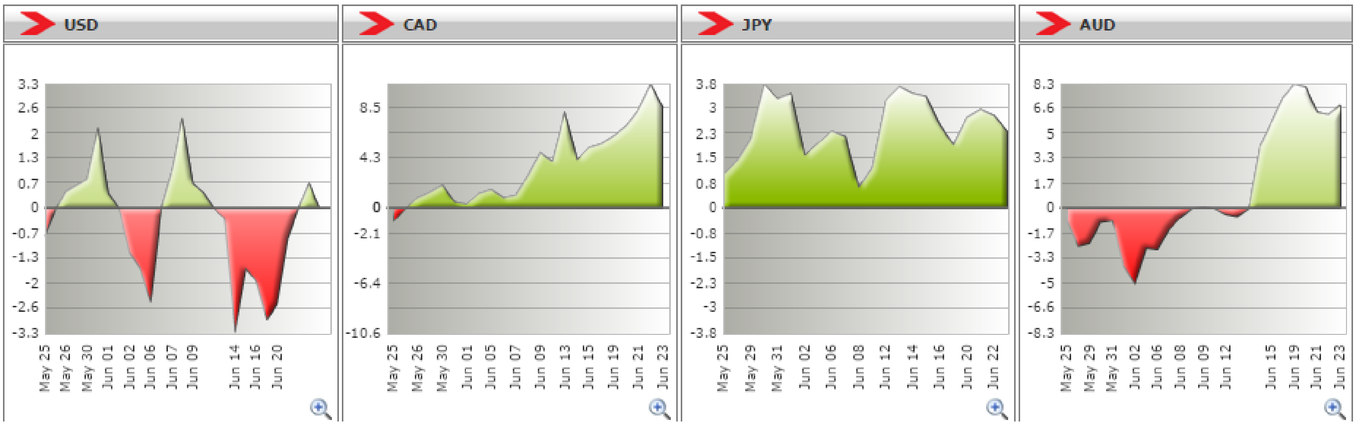
The CitiFX Flow indicator was introduced in our January 2013 *In Focus: CitiFX Flow Indicator*. Citi, placed at the top of the rankings in the most recent Euromoney survey for overall FX market share, publishes indexed FX flow values to CitiVelocity.com on a daily basis, with historical flows going back to December 2011. A normalized index of aggregate global client orders is available by currency (all G10 and 20 EM), product type (spot, forward, NDF) and client type (leveraged, real money, corporates, banks).

Figure 1 shows an example of the flow data, as available on the Citi Velocity website. The charts show the cumulative indexed net flow over a 1-month period from Citi's leveraged account clients.

In this example, clients were steady net buyers of CAD in the period shown, but were mixed on USD, as the index shows net buying in some parts of the month and net selling in other parts. Given the market share held by CitiFX, the trends in the currency flow data can be used to gauge overall market demand for a certain currency or risk premia style.

In Part 1 we look at how the charts in Figure 1, as well as others available on CitiVelocity and our weekly flow report, can be used to create trading strategies. For example, could the fact that leveraged accounts were strong buyers of CAD compared to USD (as in the charts above) say anything about the subsequent spot moves of these currencies? In Part 2 we extend the analysis to flow momentum into trading strategies and investigate capital allocation rules based on hedge fund appetite for different signals.

Figure 1: Cumulative Indexed Net FX Flow for Leveraged Accounts from CitiVelocity.com



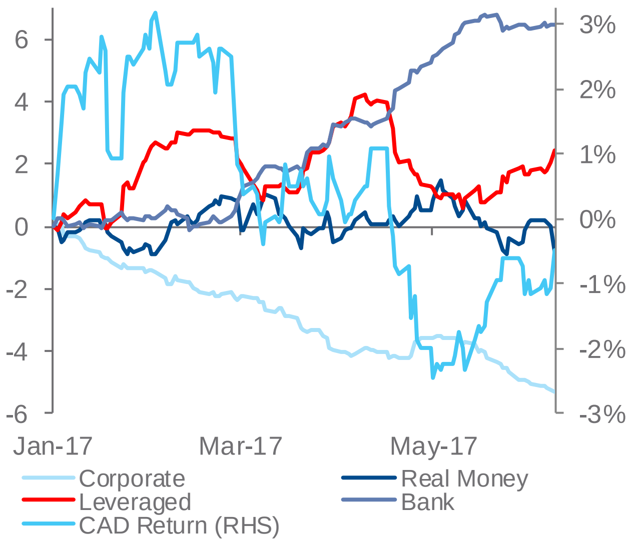
Source: Bloomberg, Citi; Sample: 25-May-17 – 23-Jun-17

Part 1: Trading G10 Currencies Using FX Flow Momentum

We begin by looking at the relationship between FX flow and currency return to better understand which client segments are best to follow. Figure 2 shows an example with the cumulative (indexed) daily net CAD flow by client segment along with the trade-weighted CAD return. In this example we see that leveraged flows have been the most closely aligned with currency moves. Real money flows have moved in tandem with spot return at times, but do not appear to be as significant of a driver of CAD relative to leveraged flows.

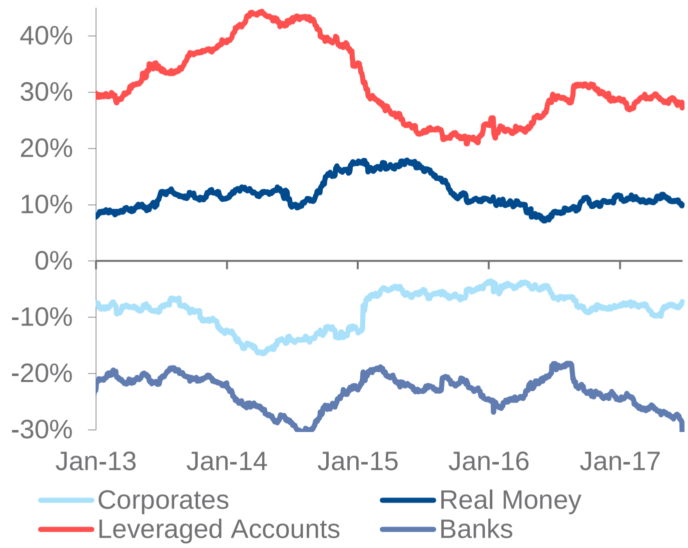
On the other hand, flows from corporates and banks appear to have had little relationship with CAD returns, with daily corporate net flow consistently negative (CAD selling) and banks positive (CAD buying). We note that patterns like this are common across many currencies with hedge fund flows having a strong relationship with the corresponding currency return but other segments particularly corporates and banks having little or no relationship.

Figure 2: Cumulative Indexed CAD Flow by Client Segment and CAD Trade-Weighted Return



Source: Citi; Sample: Jan-17 – Jun-17

Figure 3: Rolling 1Y Average Correlation: Daily Net Flow and Trade-Weighted Currency Return (all G10)



Source: Citi; Sample: Jan-13 – Jun-17

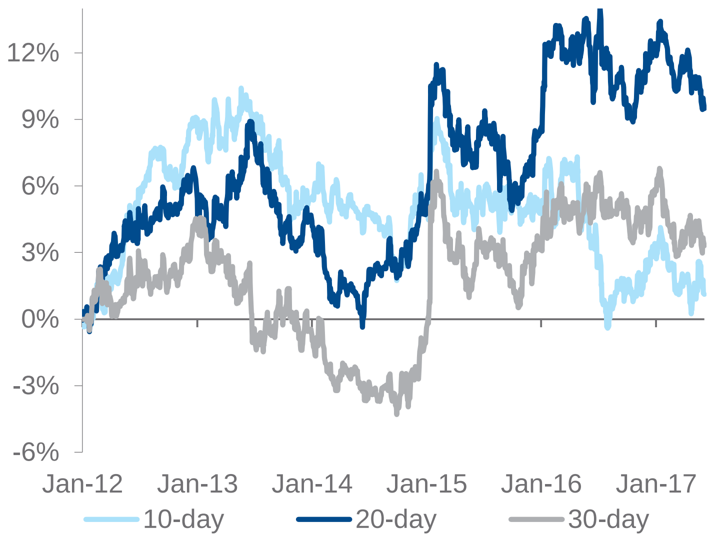
To quantify the flow and currency return relationship more generally, Figure 3 shows the 1-year rolling coincident correlation between daily net flow for a currency and its trade-weighted spot return. The correlations are averaged across the G10 currencies and shown separately by client segment. Clearly, leveraged accounts have persistently shown the highest correlation, suggesting that these clients tend to drive spot moves or at least react to them very quickly. Real money flows have also had a positive correlation with currency returns but corporates and bank client flows have had a negative correlation. Overall, this leads us to favor leveraged or possibly real money flows in strategies based on flow momentum

Back-Testing Examples Using Momentum of FX Flows

In order to test the practical tradability of momentum in flows we evaluate simple trading strategies that take directional positions in 1-month WMR forwards. Our baseline methodology is to rank G10 currencies based on the sum of flows into each currency over a prior period. Our indexed flow data are computed and published by currency (i.e. not by currency pair) so it is not possible to construct a signal directly for a pair.

However, given that currencies can be traded over a large number of pairs and we are ultimately interested in measuring the relative overall demand for a currency, we think comparing the net currency flow indicators is a superior approach.

Figure 4: Cumulative Excess Return for Leveraged Flow Ranking Strategy*, % USD



Source: Citi; Sample: Jan-12 – Jun-17. * - Version labelled '10-day' ranks G10 currencies on sum of leveraged flow over prior 10 days, top-bottom 5 ccies traded

Figure 5: Performance Statistics, % USD

	10-day	15-day	20-day	30-day	45-day
Annual Return	0.2%	3.1%	1.8%	0.6%	-0.3%
Annual Volatility	4.6%	4.7%	4.9%	4.8%	4.7%
Information Ratio	0.05	0.67	0.37	0.13	-0.06
Max Drawdown	10.8%	5.6%	9.3%	8.9%	11.7%
Calmar Ratio	0.02	0.56	0.20	0.07	-0.03

Source: Citi; Sample: Jan-12 – Jun-17

Since leveraged client flow had by far the strongest correlation with spot changes, our first strategy ranks G10 currencies based on the aggregate leveraged flow over a medium-term window and goes long the top five currencies (i.e. ones with strongest relative inflows) and short the bottom five (i.e. strongest relative outflows). We show performance for a variety of flow look-back windows.

We calculate signals weekly and enter trades at the WMR 16:00 London fix, with bid-ask trading costs and 1-month carry included in all of the back-tests. The indexed flow values are currently published over the New York night and are available by London noon for the prior day (i.e. t-1), giving a four hour window between the data observation time and hypothetical execution of the back-test.

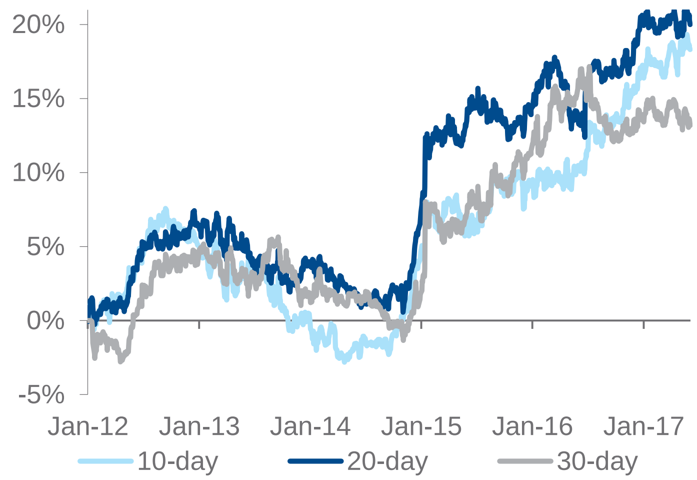
Figures 4 and 5 show the cumulative returns and performance statistics for strategies that use windows from 10 to 45 days to aggregate the leveraged flow for ranking each currency. For example, the data labelled '10-day' means that the flow used for ranking is aggregated for the prior 10 days. While not the smoothest, cumulative returns are positive for a range of look-back windows with flow aggregation periods of around three to four weeks performing best.

We note that using flows of other client segments (e.g. real money, corporates or banks) in similarly constructed strategies did not have positive performance over the same back-testing period. In addition, aggregating flows over shorter periods such as 1-day or 1-week also did not perform well as it has produced too noisy and volatile positions to get over the transaction cost hurdle.

We also evaluate an alternative version of the flow momentum ranking strategy which relies on the assumption that fast-reacting hedge fund flows can lead those from other client segments, particularly real money investors. The parameters are kept the same but instead of aggregating leveraged flow, we aggregate the difference between leveraged and real money flow, in order to capture any lag between the two investor types. For example, if hedge funds are buying EUR but real money aren't (or are selling) then it might be an opportune time to buy EUR, taking advantage of the momentum of hedge fund flows and the fact that real money may follow.

Results for this type strategy are shown in Figures 6 and 7. In this case, the results are more promising compared to prior version of using just leveraged flow. Performance has been reasonably good in most periods for a range of look-back windows, particularly since mid-2014.

Figure 6: Cumulative Excess Return for Leveraged - Real Money Flow Ranking Strategy*, % USD



Source: Citi; Sample: Jan-12 – Jun-17. * - Version labelled '10-day' ranks G10 currencies on sum of leveraged - real money flow difference over prior 10 days.

Figure 7: Performance Statistics, % USD

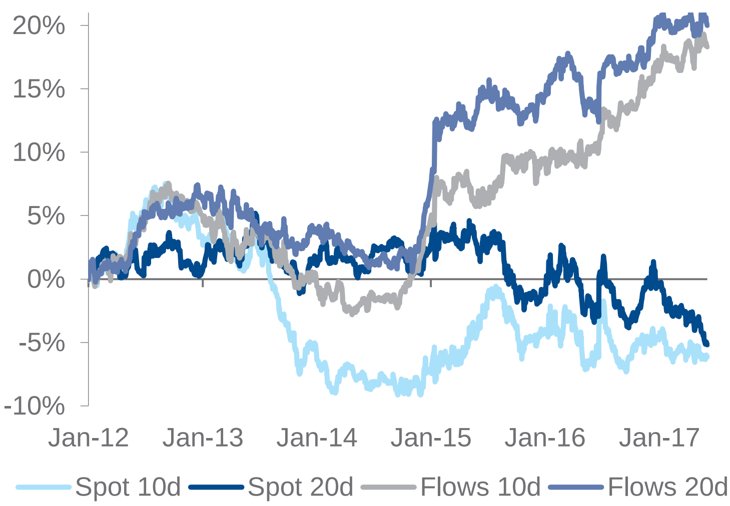
	10-day	15-day	20-day	30-day	45-day
Annual Return	3.5%	2.1%	3.8%	2.5%	0.6%
Annual Volatility	4.7%	4.5%	4.7%	4.7%	4.7%
Information Ratio	0.74	0.46	0.82	0.53	0.12
Max Drawdown	10.4%	7.7%	6.9%	7.0%	11.7%
Calmar Ratio	0.34	0.27	0.56	0.36	0.05

Source: Citi; Sample: Jan-12 – Jun-17

We note that ranking based on the aggregated difference between leveraged and corporate or bank flows has also given positive returns but performance has not been as good as leveraged minus real money shown above. In addition, an alternative to the above strategies that trade all G10 currencies (i.e. top 5 / bottom 5) is to trade only extreme ranked currencies such as top 2 / bottom 2. However, back-tests trading the extreme rank currencies had similar relative performance to the versions above.

Finally, given that leveraged flows have had a significant correlation with the trade-weight currency returns, we compare our flow momentum-based strategy with versions that use the momentum of currency returns. Overall, ranking the G10 currencies based on aggregate trade-weighted return does not perform well at all regardless of the parameter values. Example back-test results for this are shown in Figures 8 and 9. In this case, we aggregate trade-weighted currency returns over the prior 10 and 20 days and compare this to aggregating leverage minus real money flow as above. Performance using flow momentum has been better than spot momentum in most periods.

Figure 8: Cumulative Excess Return For Strategies Using Spot Trend vs. Versions Using Flows*, % USD



Source: Citi; Sample: Jan-12 – Jun-17

Figure 9: Performance Statistics, % USD

	Spot 10d	Spot 20d	Flows 10d	Flows 20d
Annual Return	-1.2%	-1.0%	3.5%	3.8%
Annual Volatility	5.2%	5.2%	4.7%	4.7%
Information Ratio	-0.22	-0.19	0.74	0.82
Max Drawdown	16.7%	10.4%	10.4%	6.9%
Calmar Ratio	-0.07	-0.10	0.34	0.56

Source: Citi; Sample: Jan-12 – Jun-17

Part 2: Hedge Fund Flow Momentum and Risk Premia Strategy Allocations

Expanding on the individual currency flow momentum analysis above, in this section we explore the value of measuring flows into risk premia strategies. Our work also builds on our August 2013 paper *In Focus: Style Investing using FX Flow Analysis*. That paper introduced the style flow indicator which measures the magnitude of client flows into risk premia styles (carry, trend and value). We have previously also used the flow indicator to assist in portfolio weight selection within our Global Scorecard, as demonstrated in the September 2016 paper *In Focus: Style Selection for CitiFX Global Scorecard*. We revisit some of the methods explored in those papers in order to test the efficacy of flows in solving the portfolio allocation dilemma. We do this by creating new style flow indicators for our Beta2 suite of FX risk premia strategies, first introduced in the August 2016 paper *In Focus: Beta2 – A Review of FX Risk Premia Strategies*.

In order to measure how closely hedge fund flow is aligned with a trading strategy (or style), we compare the strategy's signals with the daily flow indicator values for each corresponding currency. Figures 10-13 show the current risk premia strategy signals and the cumulative flows since signal inception (June 15th). For example, in Figures 10-11 we note that recent hedge fund flow has been aligned with carry and somewhat against value.

Figure 10: G10 Carry Signals and Hedge Fund Flows

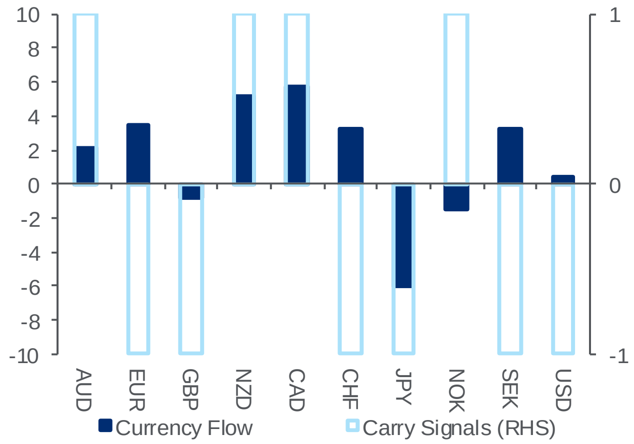


Figure 11: G10 Value Signals and Hedge Fund Flows

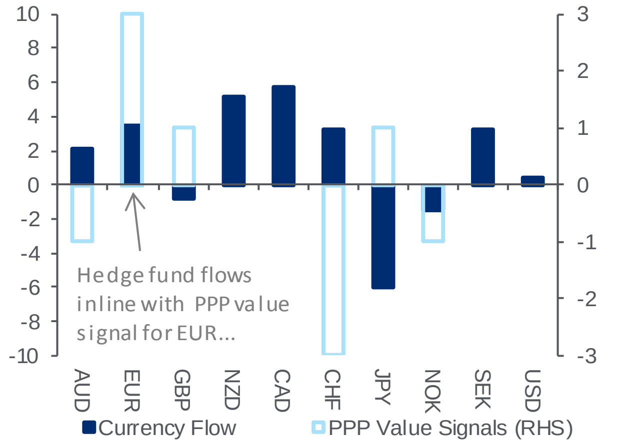
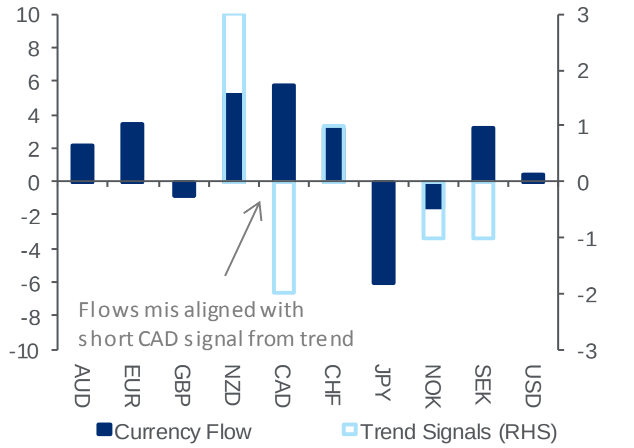
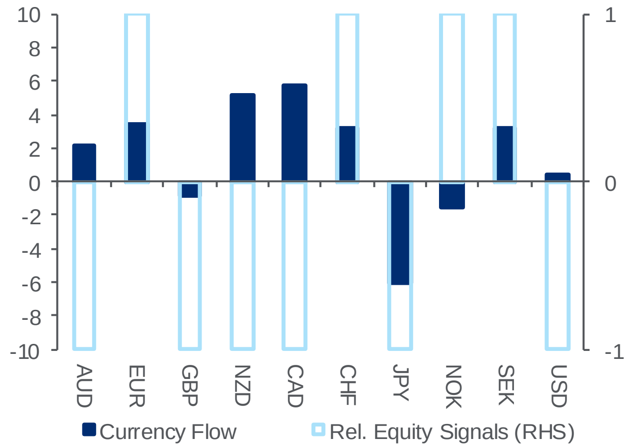


Figure 12: G10 Trend Signals and Hedge Fund Flows



Source: Citi; 15-Jun-17 to 28-Jun-2017

Figure 13: G10 Relative Equity Signals and Hedge Fund Flows



Source: Citi; 15-Jun-17 to 28-Jun-2017

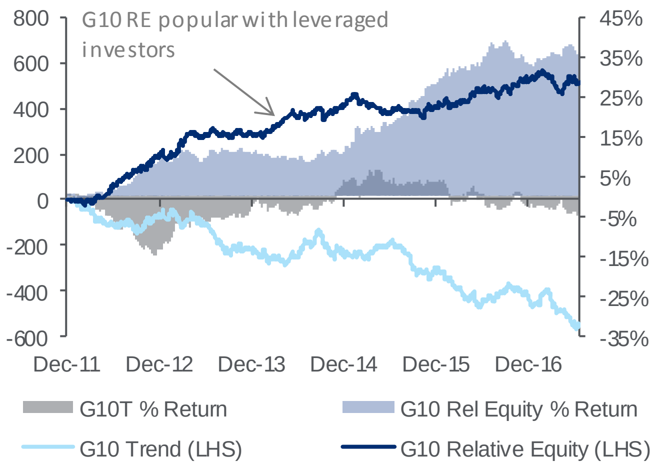
A daily style flow indicator is then calculated by taking a sumproduct of the hedge fund flow indicators and strategy signals as of the previous business day:

$$f_{s,t} = \sum_i^n (x_{i,t} \times y_{i,t-1}) \quad (1)$$

where $f_{s,t}$ is the flow into the style s at time, t, $x_{i,t}$ is the flow indicator value for currency i at time t and $y_{i,t-1}$ is the signal for currency i at time $t-1$. The reason we multiply today's flow by the signal of the day before is due to the Beta2 risk premia indices initiating their positions at the 4pm WMR London fix so the subsequent days flow value will show the extent to which the overall leveraged investor flow is aligned with the prevailing risk premia signal on that day.

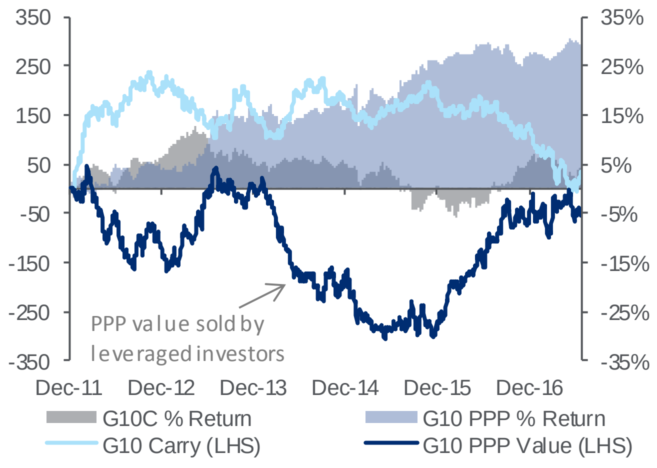
In Figures 14 and 15 below we show the cumulative style flow indicators from 2011 (flow data start date) and also the cumulative percentage returns for each strategy from that time period to present. Figure 14 shows the cumulative flows and total returns into G10 relative equity and G10 trend. We can see a pattern whereby leveraged investor flows seem to have been consistently aligned with G10 relative equity strategy's signals while they traded in the opposite direction to trend over the last six years. This has coincided with the relatively lackluster performance of G10 trend and in contrast, good returns for G10 relative equity. Our portfolio allocation rules seek to exploit momentum in this hedge fund preference for particular trading styles.

Figure 14: Cumulative Return and Cumulative Flow into Momentum Based Risk Premia



Source: Citi; Citi; Dec11 – Jun-17

Figure 15: Cumulative Return and Cumulative Flow into Cross Sectional Based Risk Premia



Source: Citi; Dec11 – Jun-17

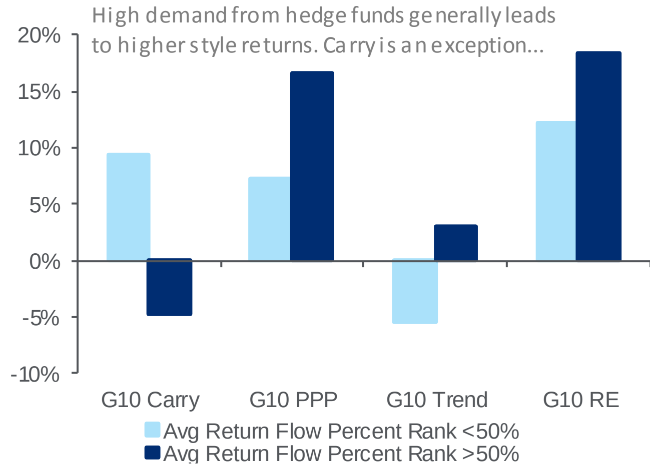
In Figure 15 we see that cumulative hedge fund flows into both carry and value have been relatively random in recent years. Hedge funds have sold carry since Q4 2015, which did coincide with a wretched period of returns for the strategy. In contrast, the value strategy has performed very well even as hedge funds traded in the opposite direction of its signals. However at the same time as hedge funds started to sell carry in Q4 2015, they started to flock to value based signals and in that time period, the value strategy gained over 5%.

Adding Value with Flows

In this section we examine hedge fund flows into each style and then use the changes in flow momentum to allocate capital to "popular" styles and decrease capital to strategies which are shunned by the leverage investor community. Figure 16 shows a simple analysis of the average returns for each style conditioned on the six-month percentile rank of its cumulative flow indicator. We can see that on average there has been a relatively clear divergence between the returns in a period of low flow momentum and in periods of high flow momentum.

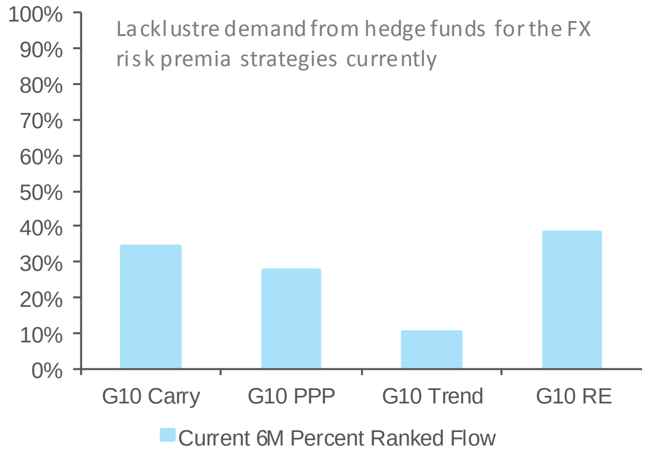
With the exception of carry, returns have been higher when flow momentum into a style has been above the 50^{th} %ile. In order words, when recent hedge fund flows have been more aligned with the style's signals, it has outperformed.

Figure 16: Average Risk Premia Returns as Function of Flow Momentum Percentile



Source: Citi; Dec-11 – Jun-17

Figure 17: Latest 6-Month Percentile Ranks of Cumulative Style Flow Indicators



Source: Citi; as of 28-Jun-2017

The different results for carry in Figure 16 perhaps relate to the vulnerability of style to crowding – carry signals are by far the easiest to construct and anecdotal evidence suggests that FX investors generally prefer positions that don't cost money to hold. Figure 15 suggest that when carry has been in weak demand then this has been the best time to enter the trade.

Perhaps this matches the old adage of being greedy when others are fearful especially for a risk correlated style like FX carry. Similarly, when carry has been very popular with hedge funds, this tends to indicate that the style is potentially overcrowded and hence subsequent returns are negative as buyers of the style become exhausted.

In Figure 17 we show the current percentile ranks of cumulative style flows into each strategy. We can see that hedge fund flows across each style look relatively low with all the strategies currently below the 50%ile levels. Positions of G10 Trend, which has under-performed in recent months, have been by far the least aligned with hedge fund flows.

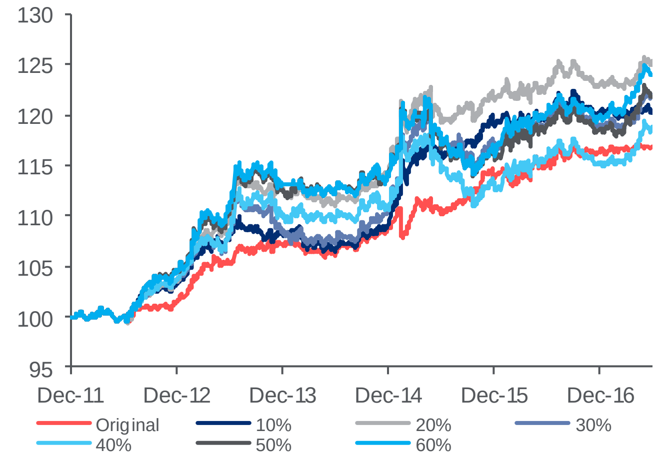
Risk Premia Selection Using Flows

Our benchmark strategy allocation method is equal weighting. We test a portfolio allocation strategy that reallocates capital between styles on a weekly basis (consistent with the individual currency trading model discussed earlier). On each portfolio rebalancing day, the decision is based on the T-1 six-month percentile rank of the cumulative style flow indicator for each strategy. This allows us to gauge the change in medium term flow momentum into each style. Figure 18 shows the back-tested performance of using the flow data to cut out of an underperforming style and reallocate capital to the remaining styles that are above the cut-out threshold.

We can see in Figure 18 that the majority of the flow filtered allocation strategies have out-performed the passive equal weighted strategy. Cutting out styles that have had very low flow momentum (below 20%) looks to add the most value, while as the flow threshold increases the number of false positives (i.e. cutting out a strategy which then does not subsequently underperform) increases, impacting risk adjusted returns negatively.

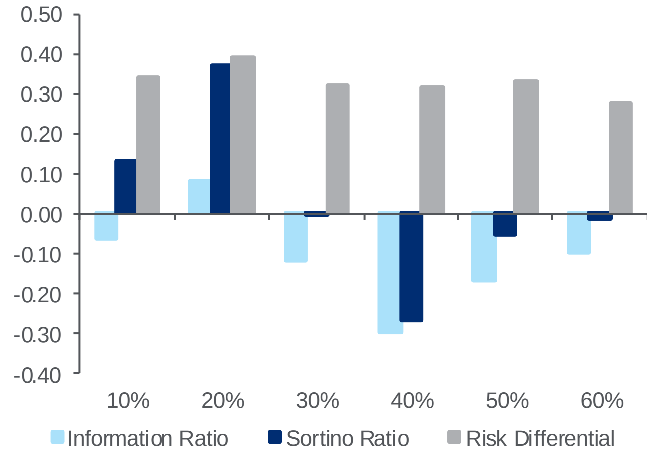
If we look at the differential from the original strategy performance statistics in Figure 19, we see that only the 10% and 20% flow filter cut outs have increased the information ratio relative to the equal weight benchmark. This is somewhat concerning as we increase return but also increase the volatility of the strategy. However, when looking at the Sortino ratio (annual return as a function of the volatility of negative returns), we see that the higher volatility of the flow filtered strategies is in part caused by the volatile nature of the upside swings in profits.

Figure 18: Performance of Risk Premia Portfolio Filtered on Flow Momentum Percentile Ranks



Source: Citi; Dec-11 – Jun-17

Figure 19: Difference in Information/Sortino Ratios and Risk Differential from Original Strategy



Source: Citi; Dec-11 – Jun-17

Figure 20: Performance Statistics of Risk Premia Strategies Filtered on Flow Momentum Percentile Ranks

		Flow Threshold									
	Original	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Ann. Return	3.17%	**3.80%**	**4.71%**	**4.09%**	**3.49%**	**4.10%**	**4.49%**	**3.65%**	**3.76%**	**3.57%**	0.48%
Ann. Volatility	2.80%	3.55%	3.88%	4.04%	4.19%	4.26%	4.36%	4.70%	4.58%	4.56%	**2.74%**
Info. Ratio	1.13	1.07	**1.21**	1.01	0.83	0.96	1.03	0.78	0.82	0.78	0.18
Sortino	1.55	**1.68**	**1.92**	1.55	1.28	1.50	1.54	1.17	1.20	1.05	0.18
Risk Diff.	0.93	**1.27**	**1.32**	**1.25**	**1.24**	**1.26**	**1.21**	**1.28**	**1.31**	**1.30**	**1.38**

Source: Citi; Dec-11 – Jun-17

The picture looks brightest when comparing the risk differentials of each strategy. The risk differential measures the volatility of profits over the volatility of losses. A higher ratio means that the size of profits and positive increases in the index is greater than the magnitude of downward swings in the index. The original strategy is beaten on all fronts on this metric.

The table in Figure 20 shows the performance statistics across all flow thresholds (10%-100%). The bold font denotes when the flow filtered strategy performance is greater than that of the original. The flow threshold increases returns in all cases bar the 100% threshold (which is a trivial threshold). The increase in volatility across the filtered strategy is due to the capital being concentrated amongst a smaller set of strategies. Most value looks to be added by simply cutting out of a strategy when that strategy's flow percentile level is below the 20% threshold.

Portfolio Re-Weighting Strategy

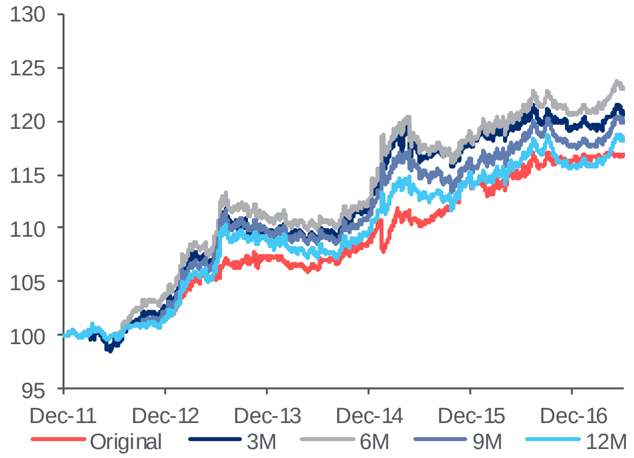
We can also use flows to scale the level of exposure a portfolio of FX risk premia has to a certain style. We do this by calculating the weight of the style in the portfolio as a function of its flow percentile level compared against the other strategies in the portfolio (2):

$$w_{i,t} = \frac{flowpercentile_{i,t}}{\sum_{i=1}^{n} flowpercentile_{i,t}} \qquad (2)$$

where $\mathrm{w}_{\mathrm{i,t}}$ is the weight assigned to strategy i at time, t and $\mathrm{flowpercentile}_{\mathrm{i,t}}$ is the flow percentile for the strategy i, at time *t.*

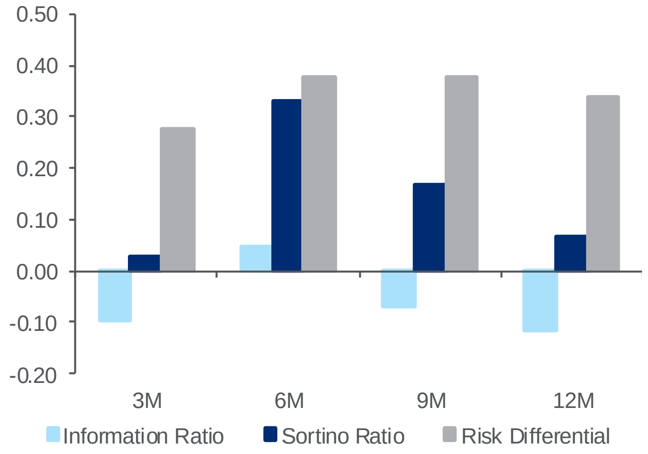
The performance of this strategy cycling through different cumulative flow look-back windows is shown in Figure 21 and Figure 22. As the flow percentile is used to calculate the weights, there is no use for a flow percentage threshold level. The only parameter we vary here is the look back over which to percentile rank the cumulative style flows. The overall results here are promising.

Figure 21: Performance of Flow Momentum Weighted Risk Premia Portfolio



Source: Citi; Dec-11 – Jun-17

Figure 22: Difference in Information/Sortino Ratios and Risk Differential from Original Strategy



Source: Citi; Dec-11 – Jun-17

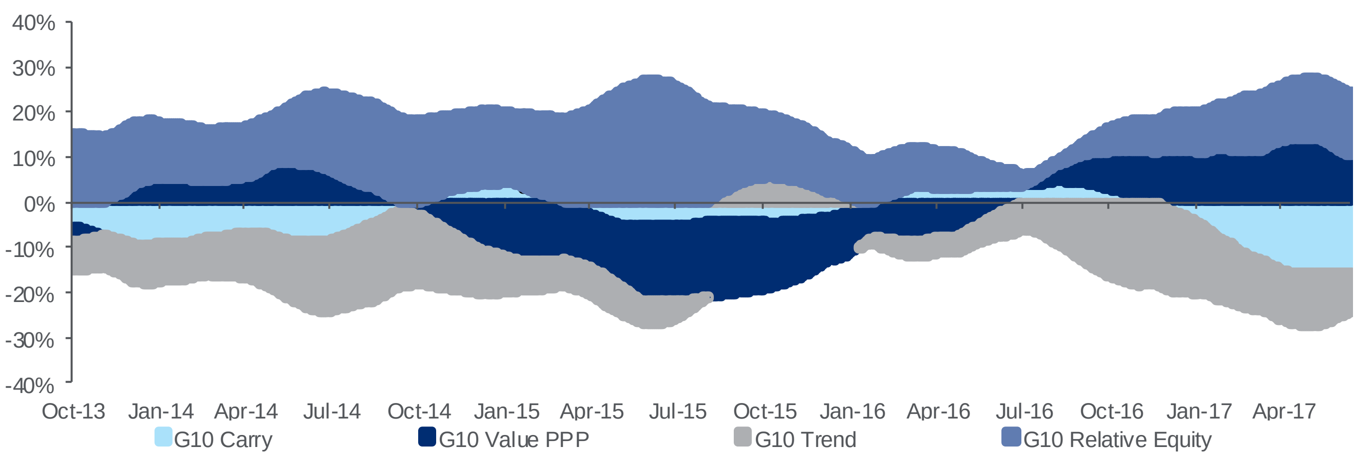
Figure 23: Performance Statistics of Risk Premia Strategies Filtered on Flow Momentum Percentile Ranks

		Percentile Ranking Look Back Period									
	Original	**1M**	**3M**	**6M**	**7M**	**8M**	**9M**	**10M**	**11M**	**12M**
Ann. Return	3.17%	3.14%	**3.89%**	**4.32%**	**4.21%**	**3.94%**	**3.74%**	**3.63%**	**3.48%**	**3.42%**
Ann. Volatility	2.80%	3.73%	3.77%	3.68%	3.64%	3.60%	3.53%	3.46%	3.41%	3.38%
Info. Ratio	1.13	0.84	1.03	**1.18**	**1.16**	1.10	1.06	1.05	1.02	1.01
Sortino	1.55	1.23	**1.57**	**1.88**	**1.88**	**1.78**	**1.72**	**1.68**	**1.63**	**1.61**
Risk Differential	0.93	**1.03**	**1.20**	**1.30**	**1.32**	**1.33**	**1.30**	**1.28**	**1.27**	**1.26**

Source: Citi; Dec-11 – Jun-17

All the strategies have out-performed the original equal weight benchmark in annual returns, sortino and risk differential statistics. The consistency of the results when varying the look-back parameters suggests that the improvement is relatively robust. Figure 23 shows the performance table, once again figures in bold display the performance metrics which beat the original equal weighted portfolio. The results here are very consistent, with all look-back (bar the very short 1M window) beating the original in annual returns, Sortino ratio and risk differential.

Figure 24: Average 1-Year Rolling Deviation in Portfolio Weights from Equal Weighted Portfolio



Source: Citi; Dec-11 – Jun-17

In Figure 24 above, we show the average deviation of weights from the equal weighted portfolio for the 1-year percentile parameter. It shows that the deviation from the equal portfolio weight can be quite drastic over the back test period. The relative equity strategy has garnered the largest weights in the portfolio as the signals of that strategy were for long periods aligned with the flows from the leveraged investor community. G10 trend strategy remains underweight for the majority of the back-test, while G10 PPP value varies around the equal 25% weight.

From the results above it would seem that choosing portfolio weights based on leveraged investor flow momentum can add value over and above that of the equally weighted portfolio.

Conclusion

We have shown how an investor can use the CitiFX Flow Indicator in multiple ways to add value to both individual currency trading and also in identifying styles which are poised to out-perform. In the first section, we demonstrated how ranking G10 currencies based on leveraged investor and real money flows can be used to create trading strategies that have been historically profitable.

In the second section we evaluated how investor flow can be used to gauge risk premia demand and how this information can add value to a portfolio allocation process. A flow-based portfolio weighting approach has out-performed an equally weighted portfolio across most performance metrics.

Clients can follow CitiFX Flow data by logging on to citivelocity.com and reading our weekly Global Flows report that we publish on CitiFX Wire on Mondays.

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