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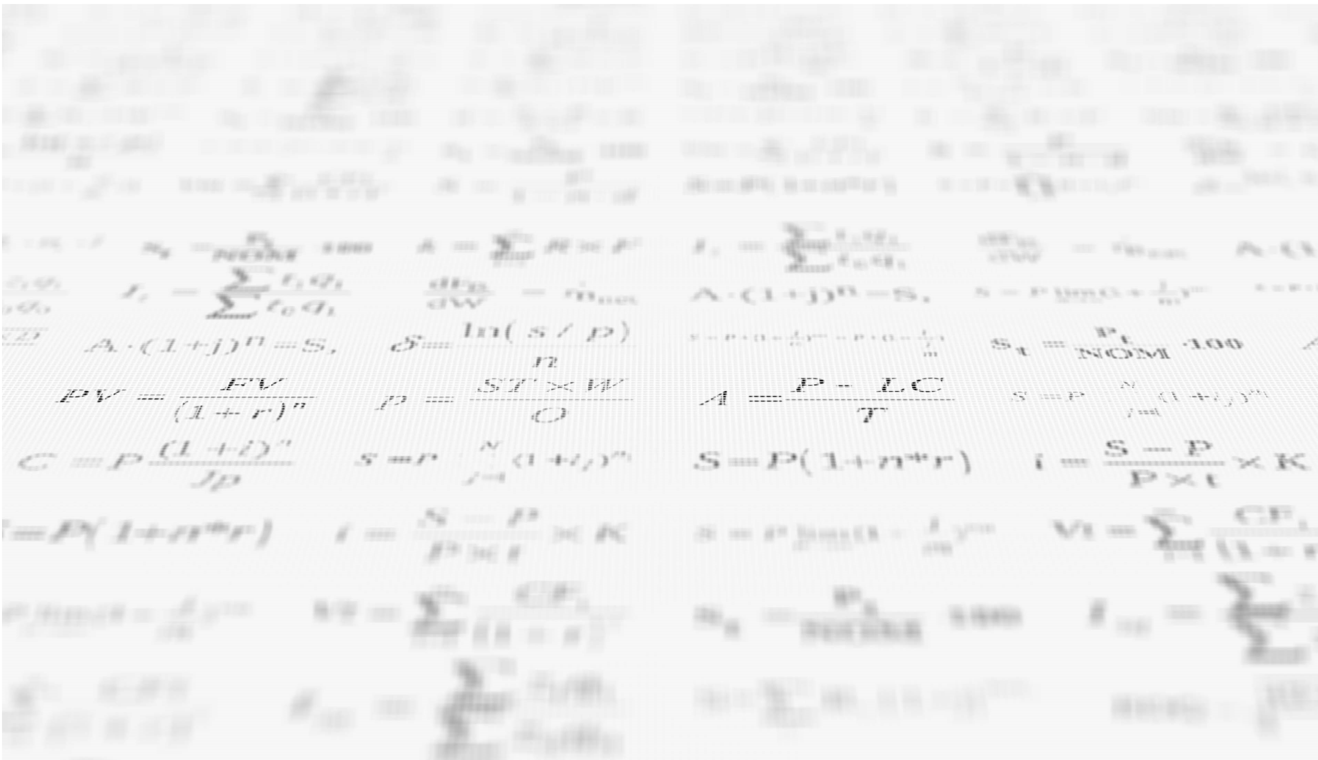
J.P.Morgan digest on risk premia strategies

Summary of Q2'21 research reports on systematic investing



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See page 36 for analyst certification and important disclosures, including non-US analyst disclosures.

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Executive Summary

The current report is a part of periodic series that summarizes the publications of the J.P.Morgan research department that focus on risk premia investing and systematic strategies. Below we review the relevant research notes in Q2'21 across various research groups that can be broadly classified in the following streams:

- Pure risk premia styles within the FICC universe
- Derivatives systematic strategies
- Portfolio construction
- Systematic strategies in credit and FX
- Regime detection
- Thematic investing
- Systematic strategies based on retail trading activities
- Structural breaks in equity risk premia

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Pure risk premia styles within the FICC universe

Disentangling cross-sectional momentum and carry effects – application to commodities risk premia

In The quest for pure equity factor exposure and Custom Performance Attribution based on Portfolio Holdings the concept of pure factors in the equities space has been introduced. The same concept is difficult to implement within the FIC universe, due to the limited number of underlying assets

In Disentangling momentum and carry in commodities, structural breaks in risk premia and latest model views the framework introduced in Market-neutral carry strategies is employed to disentangle the effects of the main risk premia styles. In particular, the focus has been on the isolation of the cross-sectional momentum and carry effects with an illustration for the commodities asset class. In the commodities space there is a strong fundamentally-based relationship between the carry and the momentum that leads to an overlap and positive correlation between the typical cross-sectional carry and cross-sectional momentum strategies

First, the standard implementations of the cross-sectional carry and momentum strategies have been done. In the case of the cross-sectional carry strategy first the assets are ranked by the carry/vol ratio and then we go long top quantile and short bottom quantile with the asset weight being proportional to the inverse of the asset's volatility. At the end the portfolio is geared to a 10% annualized vol target.

The standard cross-sectional momentum strategy relies on the trend-following signal introduced in Designing robust trend-following system. In a similar way the assets are ranked by the trend-following signals and we go long the top quantile and we are short the bottom quantile with the asset weight being proportional to the inverse of the asset's volatility. The annualized portfolio volatility is similarly targeted to be 10%.

Next, the pure versions of the cross-sectional carry and momentum strategies have been put forward. The market-neutral carry strategy was introduced in market-neutral carry strategies. The same concept has been leveraged to construct the market-neutral cross-sectional momentum strategy.

The market-neutral cross-sectional momentum strategy has also been designed to eliminate the main risk factors within a given asset class and to provide a return stream driven by what we refer to as the asset-specific trends – those are the idiosyncratic average returns that are not attributable to the assets exposures to the factors. During an optimization the portfolio exposure to the asset specific trends is optimized with neutrality to the main factors and in addition a neutral (zero) portfolio carry income.

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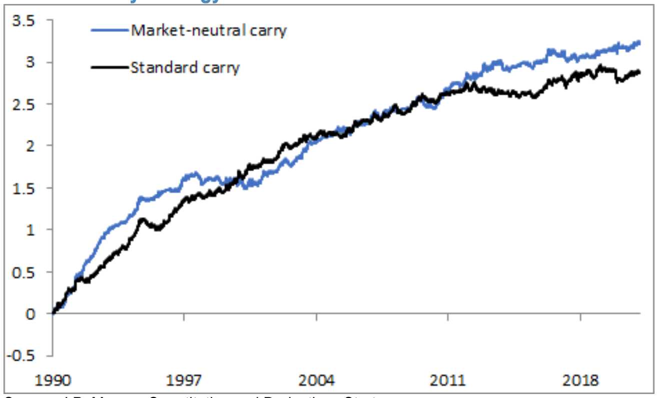
Figure 1: Cumulative performance of the market-neutral carry and standard carry strategy



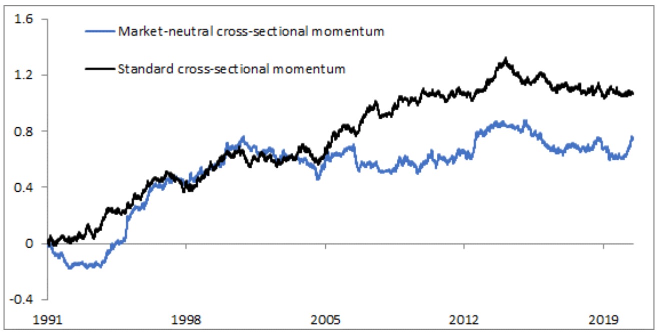
Source: J.P. Morgan Quantitative and Derivatives Strategy

Table 1: Performance statistics

	Market-neutral carry	Standard carry
Ann Return	10.1%	10.2%
Ann Volatility	8.9%	10.2%
Sharpe	1.13	1.01
Max DD	18.8%	24.1%
Skewness	0.05	-0.10
Kurtosis	1.72	0.73

Source: J.P. Morgan Quantitative and Derivatives Strategy

Figure 2: Cumulative performance of the market-neutral cross-sectional momentum and standard cross-sectional momentum



Source: J.P. Morgan Quantitative and Derivatives Strategy

Table 2: Performance statistics

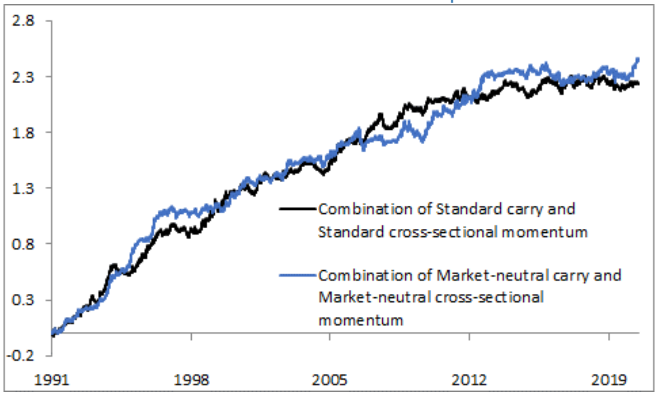
	Market-neutral cross-sectional momentum	Standard cross-sectional momentum
Ann Return	2.5%	4.7%
Ann Volatility	7.5%	10.0%
Sharpe	0.33	0.47
Max DD	31%	39%
Skewness	-0.04	-0.15
Kurtosis	1.20	1.00

Source: J.P. Morgan Quantitative and Derivatives Strategy

There is no substantial difference in the performances of the market-neutral carry strategy and standard carry strategy with the market-neutral carry strategy demonstrating a more consistent performance in the recent years. Turning to the cross-sectional momentum strategy, the standard implementation has overall better performance. The standard carry and cross-sectional momentum strategies are highly correlated. In contrast the market-neutral implementations of the carry and the momentum strategies have a negligible correlation.

Next, an equally-weighted (in terms of vol budget) portfolio of the carry and momentum styles has been constructed. Despite the inferior performance of the market-neutral cross-sectional system in comparison to the standard one, the combination of the market-neutral styles is performing slightly better than the combination of the standard styles because of the lower correlation. The lower and more stable correlation among the market-neutral styles allows for prudent risk allocation and well-defined performance attribution.

Figure 3: Cumulative performance of the combination of carry and momentum under the standard and market-neutral implementations



Source: J.P. Morgan Quantitative and Derivatives Strategy

Table 3: Performance statistics

	Combination of market-neutral carry and cross-sectional momentum	Combination of standard carry and cross-sectional momentum
Ann Return	5.9%	7.0%
Ann Volatility	6.4%	8.4%
Sharpe	0.91	0.83
Max DD	15.3%	15.0%
Skewness	-0.01	-0.12
Kurtosis	1.41	0.94

Source: J.P. Morgan Quantitative and Derivatives Strategy

Trend-Following in Factors

In Risk premia performance review, trend-following in factors and latest model views the effort to disentangle various risk premia styles within the FICC universe and to provide a pure factor implementation has been continued. A trend-following in factors approach has been proposed as an alternative to the traditional trend-following implementation as introduced in Designing robust trend-following system in which the trend-following signal is based on the individual asset.

The trend-following in factors approach is as follows:

- The returns of Principal Components over the lookback period are reconstructed. The number of components using the Empirical Kaiser Criterion (Braeken, 2017).[1] The returns of the Principal Components are calculated as:

$$R\_PC_i = \sum R\_Asset_j * Comp_{i,j} \quad ,$$

where $Comp_{i,j}$ is the j^{th} element in i^{th} eigenvector scaled by the volatility of the j^{th} asset.

- Trend-following signal (S_PCA_i) are calculated for each R_PC_i using methodology described in Designing robust trend-following system.

- A prudent decision reflecting the importance of the individual factors is to allocate a risk budget based on the fraction of the variance explained. We know that the fraction of the variance explained by the i^{th} factor is proportional to the eigenvalue (λ_i) associated with the i^{th} factor. Furthermore, for uncorrelated assets the position in an asset i is proportional to the ratio of $\sqrt{RB_i}/\sigma_i$, where RB_i is the respective risk budget and σ_i is the volatility of asset i.[2] Therefore, abstracting from the magnitude of the trend-following signal (or assuming an equal signal) we allocate equally among the principal components.

[1] Note that in market-neutral carry strategies we prefer to err on the side of caution, i.e. overhedge if necessary, and that is why the standard Kaiser Criterion was applied.
[2] See for example Managing Risk Exposures using the Risk Budgeting Approach

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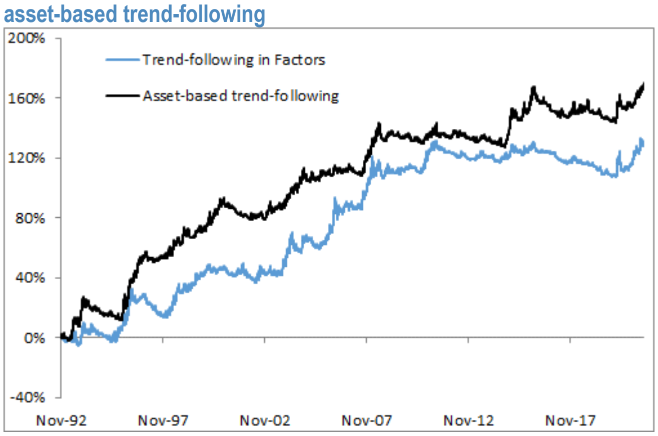
- Subsequently, the position in asset j is:

$$Pos_j = \sum \sum S\_PCA_i * Comp_{i,j}$$

- The annualized portfolio volatility is targeted to be 10% on an expanded window lookback.

The asset-based trend-following system presented in Designing robust trend-following system has slightly outperformed the trend-following in factors system over the backtest period. The trend-following in factors strategy has negligible correlations with the market-neutral implementations of carry and cross-sectional momentum, which facilitates risk allocation and performance analysis.

Figure 4: Cumulative performance of trend-following in factors and asset-based trend-following



Source: J.P. Morgan Quantitative and Derivatives Strategy

Table 4: Performance statistics

	Trend-following in Factors	Asset-based trend-following
Ann Return	4.4%	6.4%
Ann Volatility	8.8%	9.7%
Sharpe	0.50	0.65
Max DD	23.5%	27.0%
Skewness	-0.19	-0.14
Kurtosis	6.37	5.65

Source: J.P. Morgan Quantitative and Derivatives Strategy

Nevertheless the merits of the trend-following in factors approach shall not be solely judged on the performance metrics. The correlations of the trend-following in factors with the market-neutral carry strategy and the market-neutral cross-sectional momentum strategy are quite contained. As a consequence, the allocation decisions and the performance attribution are much more straightforward in the case of the pure risk premia strategies.

Table 5: Correlation matrix

	Trend-following in Factors	Market neutral Carry	Market-neutral cross-sectional momentum	Asset-based trend-following	Standard cross-sectional momentum	Standard carry strategy
Trend-following in Factors	1.00	0.00	0.16	0.54	0.40	0.08
Market neutral Carry	0.00	1.00	0.06	0.09	0.27	0.57
Market-neutral cross-sectional momentum	0.16	0.06	1.00	0.18	0.44	0.08
Asset-based trend-following	0.54	0.09	0.18	1.00	0.47	0.26
Standard cross-sectional momentum	0.40	0.27	0.44	0.47	1.00	0.39
Standard carry strategy	0.08	0.57	0.08	0.26	0.39	1.00

Source: J.P. Morgan Quantitative and Derivatives Strategy

Furthermore, two versions of optimized implementations of the trend-following in factors approach have been proposed. The first implementation minimizes the cost of the strategy. The second optimization maximizes the net expected return of the strategy. The cost minimization approach achieves sizable cost savings but the

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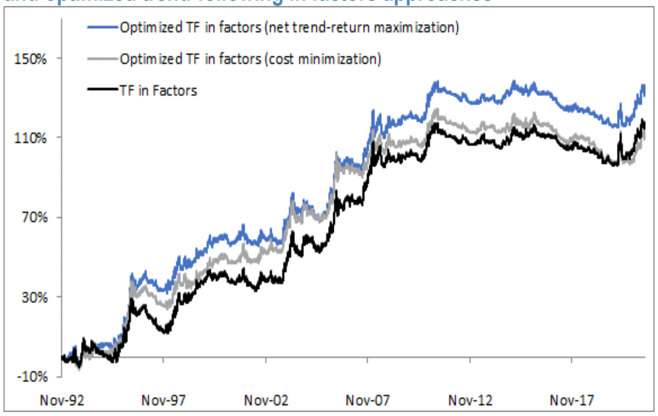
overall Sharpe ratio is barely changed. The net-trend return optimization provides an improvement in the Sharpe ratio with a slightly better control on costs.

Figure 5: Cumulative performance of the trend-following in actors and optimized trend-following in factors approaches



Source: J.P. Morgan Quantitative and Derivatives Strategy

Table 6: Performance statistics

	Optimized TF in factors (cost minimization)	TF in Factors	Optimized TF in factors (net trend-return maximization)
Ann Return	3.8%	4.4%	5.5%
Ann Volatility	7.8%	8.8%	9.4%
Sharpe	0.48	0.50	0.58
Max DD	27.8%	23.5%	28.0%
Skewness	-0.17	-0.19	-0.28
Kurtosis	8.91	6.38	5.69

Source: J.P. Morgan Quantitative and Derivatives Strategy

The cost minimization approach achieves sizable cost savings but the overall Sharpe ratio is barely changed. The net-trend return optimization provides an improvement in the Sharpe ratio with a slightly better control on costs.

Derivatives systematic strategies

Optimal Variance Replicating Portfolio

Traditionally, to replicate a variance swap, the trader holds a static portfolio of out of the money options, weighted by the inverse of their squared strike prices.

$$V = \sum_{K<F} w_K P(K) + \sum_{K\geq F} \mathrm{w}_K C(K)$$
$$w_K = \frac{2}{T} \cdot \frac{\Delta K}{K^2}$$

In the equations above, w_k denotes the weights of the option with strike K, and $P(K)$ and $C(K)$ are the prices of puts and calls at forward F and strike K, respectively. ΔK is the distance from the previous strike and finally, T is the time to maturity.

While such a weighting scheme represents the market risk neutral expectations of future volatility, the resulting implied variance is also well known to be a biased estimator of realized volatility.

In other words, there may be better weightings that allow investors to more effectively predict future realized volatility and monetize the volatility risk premium. In the report Optimal Variance Replicating Portfolio we examine a simple method, adapted from Carr, Wu, and Zhang (2020)[3], to construct optimal variance swap replicating portfolios that achieve these goals.

We run the following regression:

$$\sigma^2 = \sum_{K<F} \beta_K w_K P(K) + \sum_{K \geq F} \beta_K w_K C(K)$$

Since the estimates are a linear combination of call and put prices, the β_K from this regression can be used as adjustments to w_K to form a static portfolio of options.

The empirical results show that across indices and maturities, the options between 90 - 100% strikes have the lowest weights (are rich), and OTM strikes, especially on the call wing, receive the most weights (are cheap). Remarkably, we do not find systematic richness in the left tails. This seems to suggest much of the volatility premium comes from slightly out of the money put strikes.

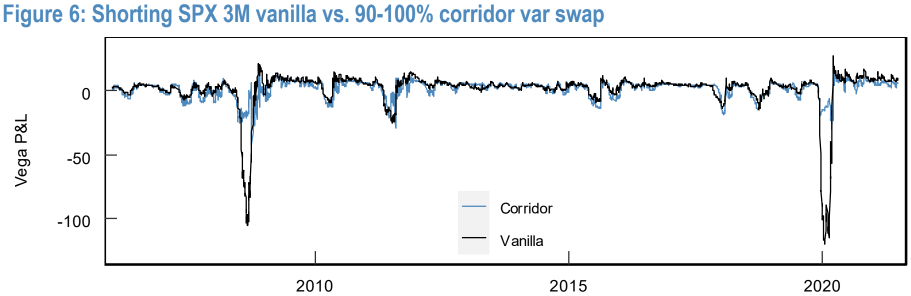
We demonstrate that when applied to S&P 500 and Euro STOXX 50, the proposed portfolio constructions: 1) better predict future realized volatility than the implied variance levels, and 2) result in more profitable volatility strategies.

Table 7: Performance statistics of short variance swap strategies

	Vanilla		90 - 100% Corridor		105% Up	
P&L (Vega)	2006 - Present	2010 - 2019	2006 - Present	2010 - 2019	2006 - Present	2010 - 2019
Mean	1.6	3.1	2.0	2.5	0.3	0.0
St Dev	16.2	7.7	0.7	5.7	4.0	3.7
Sharpe	0.2	0.8	0.6	0.9	0.1	0.0
Skew	-5.1	-6.2	-1.7	-1.8	-2.2	-3.4

Source: J.P. Morgan

Figure 6: Shorting SPX 3M vanilla vs. 90-100% corridor var swap



Source: J.P. Morgan

[3] Carr, Peter, Liuren Wu, Zhibai Zhang, 2020 Using Machine Learning to Predict Realized Variance, Journal Of Investment Management, Vol. 18, No. 2 (2020) pp 1 – 16

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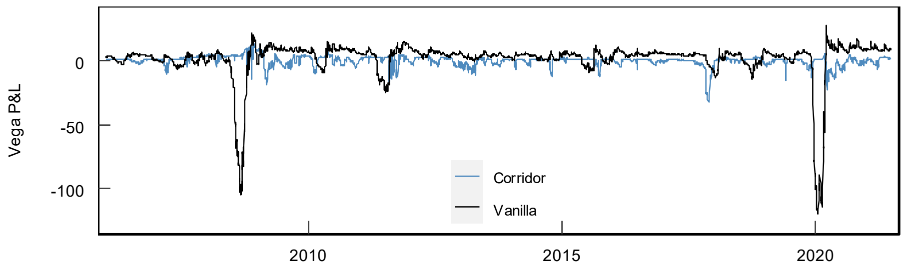
Figure 7: Shorting SPX 3M vanilla vs. 105% up var



Source: J.P. Morgan

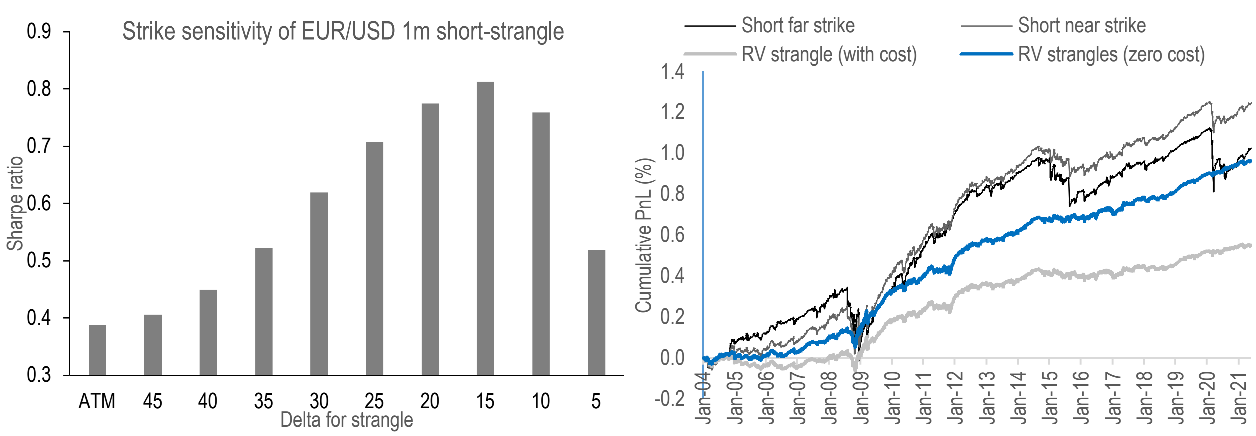
More on FX Vol Convexity Smile Strategies

An extensive recent report on cross-asset vol-of-vol strategies found as main conclusion the observation that OTM options might be statistically overvalued. In there, plain vanillas and exotics constructs across markets were investigated, with the purpose of drawing general conclusions rather than market-specific features, like sensitivities to pricing parameters.

A shorter follow-up focused on a few aspects that did not find room in the "big-picture" report above. Having assessed the presence of a premium on OTM options, the natural question which follows is: OK, but how does that premium vary with the choice of the option's strike?

Figure 8 (LHS) takes EUR/USD, 1m short delta-hedged strangles as a case study and considers the sensitivity of the resulting long-term Sharpe ratio to the actual strike (or Delta). The Sharpe ratio roughly doubles by moving from ATM to 15D strikes, and starts to decline for further OTM strikes, in particular 5D ones. Similar conclusions can be drawn for other G10 volatilities. It is confirmed how ATM vols offer typically the best entry point for long-vol trades; conversely, 15D strangles are associated with the best ex-post performance measures for harvesting vol premium purposes.

Figure 8: For 1m EUR/USD short-Gamma, highest Sharpe is found for 15delta strangle. Short strangle hedged with long 5delta strangle, in -2:+1 Vegas, for EUR/USD 1m gives decent long term statistics.



Source: J.P. Morgan Quantitative and Derivatives Strategy

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The next (more ambitious) step in terms of reasoning considers the possibility of trading RV strangle constructs based on the conclusions above. Long straddle / short strangle was the simplest plain vanilla structure allowing the capture an exposure to the aforementioned vol-of-vol premium. Replacing the ATM with a 5D leg is conceptually interesting, offering an expected higher protection in case of "fat-tailed" vol events. Adjusting the relative scaling between the two legs proves however a crucial input towards the success of the RV strategy. The case study of the -15D/+5D strangle RV construct for 1M EUR/USD, in -2:+1 Vega notionals, leverages on the features discussed above, allowing to capture vol premium while limiting drawdowns.

Similar conclusions apply for other volatilities, although we stress that 5D and generally deep OTM options are less liquid that closer to the money options: therefore, the possibility of trading the structure will depend on market liquidity and positioning.

Double No-Touches Go Quantum, the First Look

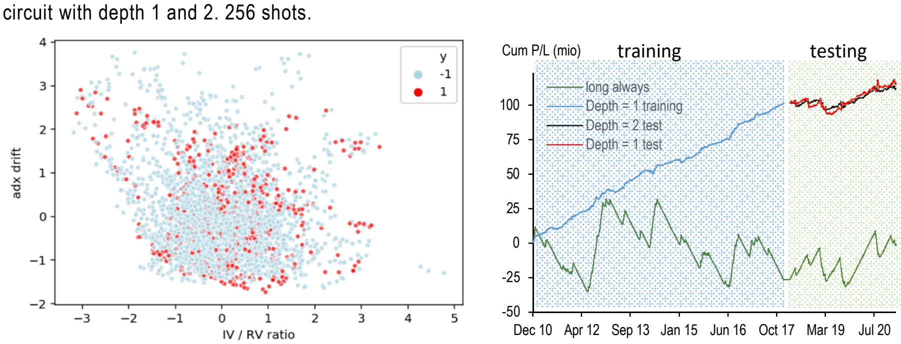
In Double no-touches go quantum, the first look the feasibility of developing a quantum SVM trading model has been explored. DNTs are a natural fit for an SVM type of problem with their binary outcome and while a classical SVM should suffice, prodded by an occasional interest by more adventurous clients into quantum machine learning we test drive making a model on a quantum simulator.

The appeal of DNTs is in their defined downside. Holder of a DNT pays a premium to be short vol in leveraged format. Market price represents theoretical probability that the structure would indeed survive till expiry and pay the holder the full notional. The barriers are continuous, thus exposed to noise and intraday spot jitter.

Quantum kernel is just an exotic kernel that maps our classical features into a higher dimension space (just as the classical basis function kernel does) where it may be easier to train SVM to separate positive and negative DNT outcomes. While kernels come from a quantum distribution the optimization is same as for the classical SVM.

Figure 9: Linearly inseparable data for 3M AUD/USD 20% TV. QSVM models largely able to compensate for downturns.

Categorical *y* variable -1 = barrier hit, i.e.-TV payout, and 1 = DNT survived till expiry, i.e. 100-TV payout. Input variables: implied / realized ratio (noise level variable) and 14day ADX indicator (centered at 22.5) – drift variable. Input features are scaled and centered via standard scaler. Quantum kernel – 2nd order Pauli-Z circuit with depth 1 and 2. 256 shots.



Source: J.P. Morgan

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The results demonstrate value in using quantum kernels in FX trading, but the speed of computation on a quantum simulator remains an obstacle for refining and testing robustness of the models. With the encouraging start the next step would be a further refinement, bigger pull of features, and kernels beyond the second-order Pauli-Z, as well as testing QSVM on a broader pool of currency pairs to assess the robustness. Finally, while we have seen interest in the broader quantum ML topic from some clients, for now we remain of opinion that QSVM is just another SVM kernel, and still a bit of an academic exercise.

Systematically monetize bond/equity correlation premium via vanilla options

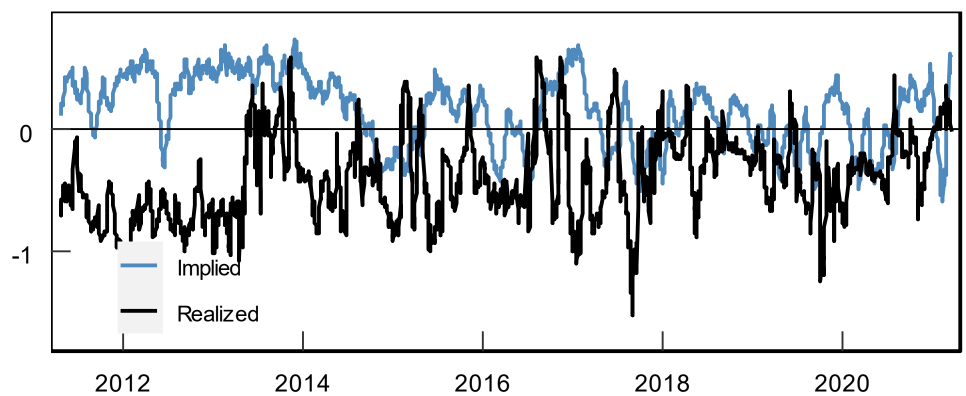
In the report Cross Asset Volatility What can option implied skew tell us about bond equity correlation?, it was discussed how to obtain implied correlation and beta between US equities and Treasuries using listed options on the SPY and TLT ETFs.

$$\rho = \left(\frac{SKEW_{TLT}}{SKEW_{SPY}}\right)^{\frac{1}{3}}$$

$$\beta = \left(\frac{SKEW_{TLT}}{SKEW_{SPY}}\right)^{\frac{1}{3}} \left(\frac{VAR_{TLT}}{VAR_{SPY}}\right)^{\frac{1}{2}}$$

Additionally, it was observed that implied correlation and beta tend to trade at a premium to the subsequent realized measures.

Figure 10: TLT/SPY realized beta vs. 1-month moving average of implied beta
1-month beta of TLT daily returns with respect to SPY



Source: J.P. Morgan

In the report Systematically monetize bond/equity correlation premium via vanilla options a simple option strategy between SPY and TLT is proposed to take advantage of the mispricing. In effect, we are going long the cheaper protection (TLT calls) and short the richer protection (SPY puts), assuming the correlation stays negative. In Figure 11 below we show the P&L of a systematic implementation where we sell 1x 1M 25 delta SPY puts to buy multiple 1M 25 delta TLT calls, premium neutral. The Sharpe ratio of the strategy is around 0.78 annualized. Additionally, the payoffs do not exhibit a negative skewness, unlike other short correlation strategies.

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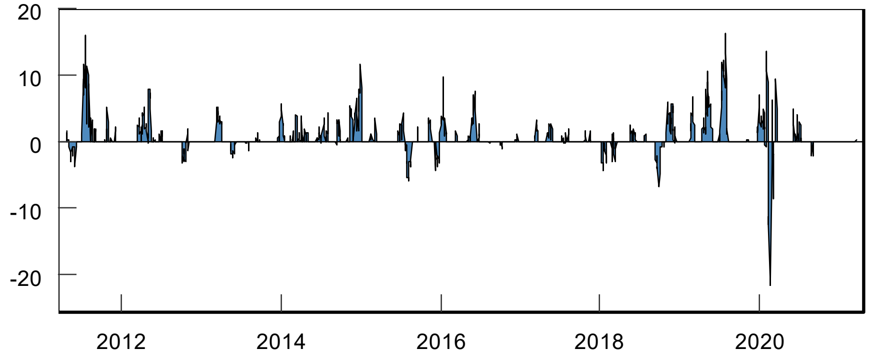
Figure 11: Terminal P&L of the TLT/SPY 1M option switch strategy

P&L as % of SPY notional



Source: J.P. Morgan

The strategy involves only vanilla options of the two ETFs and is effective in exploiting the implied to realized premium.

The strategy is profitable but occasionally shows sharp drawdowns, which coincide with periods of positive bond/equity correlation. An enhancement to the strategy by overlaying a high frequency correlation forecast as a timing signal has been proposed. The model forecasts the one week ahead realized correlation, using intraday prices measured at 15 minute intervals and the details of the model can be found in the Appendix of the paper.

Synthetic defensive long vol strategy

In the publication Quarterly review, Credit value, Synthetic defensive long vol and latest model views, the suite of defensive strategies introduced in 'Defensive Risk Premia: Systematic Strategies for the Risk-Off Times' has been augmented by a long vol synthetic defensive basket that invests in various maturities along the VIX futures curve. The methodology behind the **synthetic defensive baskets** is based on our market-neutral carry strategy (Market-Neutral Carry Strategies). The strategy relies on opportunistic capture of both carry and momentum income opportunities which facilitate the maintenance of a hedging position in the desired direction.

In the case of the synthetic defensive vol strategy we aim to obtain a long exposure to volatility coupled with advantageous carry and momentum properties via a long/short basket invested in different maturities VIX futures. Long volatility positions are typically associated with negative carry and the synthetic defensive basket investing in various maturities VIX futures can alleviate this problem by being both long carry and having a positive exposure to momentum.

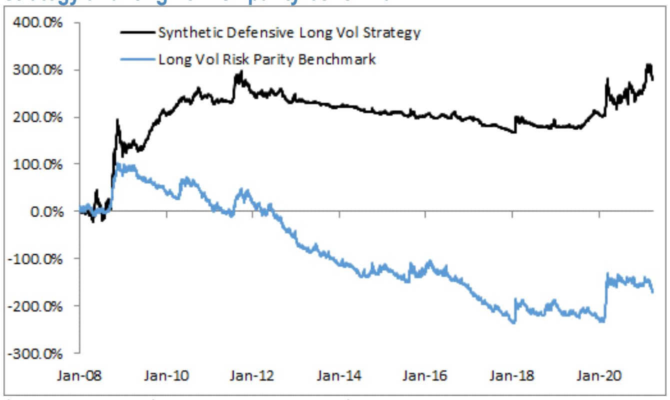
The long vol synthetic position is constructed as a basket of long/short positions in the first 8 contracts on the VIX futures curve and the lookback periods are 1Y and 2Y.

The synthetic defensive strategy strongly outperforms the long vol benchmark that takes long positions in the same futures with position sizes being determined via a risk parity approach[4].The synthetic defensive vol strategy has also strongly

[4] The volatility of the benchmark is set to the average volatility of the constituents.

outperformed the benchmark during the GFC and the subsequent rebound market rebound in 2009. The performance in March 2020 has been similar but subsequently synthetic defensive vol strategy has given up the gains more quickly. Nevertheless, the overall performance in 2020/2021 has been quite similar.

Figure 12: Cumulative performance of the synthetic defensive long vol strategy and long vol risk parity benchmark



Source: J.P. Morgan Quantitative and Derivatives Strategy

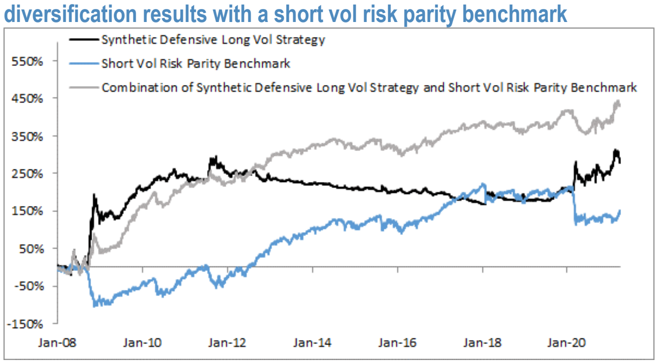
Table 8: Performance statistics

	Synthetic Defensive Long Vol Strategy	Long Vol Risk Parity Benchmark
Ann Return	21.2%	-12.9%
Ann Volatility	41.1%	41.1%
Sharpe	0.52	-0.31
Max DD[5]	75.6%	98.4%
Skewness	1.43	2.06
Kurtosis	23.32	22.49

Source: J.P. Morgan Quantitative and Derivatives Strategy

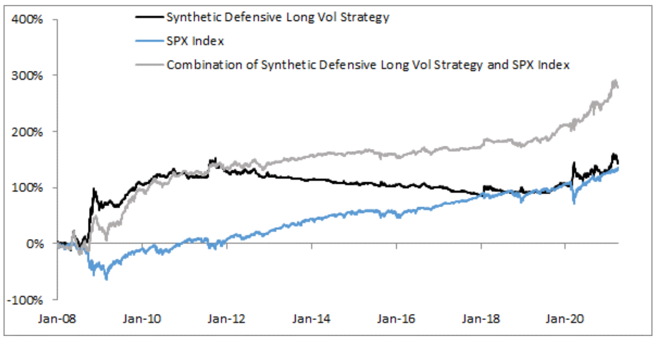
The synthetic defensive long vol strategy brings strong diversification to a short vol benchmark and also to a long position in a typical risk-on asset as S&P500. In both the cases the combined Sharpe ratio and the drawdowns are substantially improved. Therefore, synthetic defensive long vol strategy can be used as another tool in our toolbox of defensive strategies.

Figure 13: Backtest of the synthetic defensive long vol strategy–diversification results with a short vol risk parity benchmark



Source: J.P. Morgan Quantitative and Derivatives Strategy

Figure 14: Backtest of the synthetic defensive long vol strategy–diversification results with SPX



Source: J.P. Morgan Quantitative and Derivatives Strategy

[5] Please note that the drawdowns are calculated based on the compounded returns.

Table 9: Performance statistics

	Synthetic Defensive Long Vol Strategy	Short Vol Risk Parity Benchmark	Combination of Synthetic Defensive Long Vol Strategy and Short Vol Risk Parity Benchmark	Synthetic Defensive Long Vol Strategy	SPX Index	Combination of Synthetic Defensive Long Vol Strategy and SPX Index
Ann Return	21.2%	11.5%	32.7%	10.8%	10.2%	21.0%
sAnn Volatility	41.1%	41.1%	38.9%	21.0%	21.0%	20.9%
Sharpe	0.52	0.28	0.84	0.52	0.49	1.01
Max DD	75.6%	76.9%	52.5%	50.0%	52.6%	36.7%
Skewness	1.43	-2.07	-0.94	1.43	-0.26	-0.65
Kurtosis	23.32	22.59	11.36	23.32	12.78	14.38

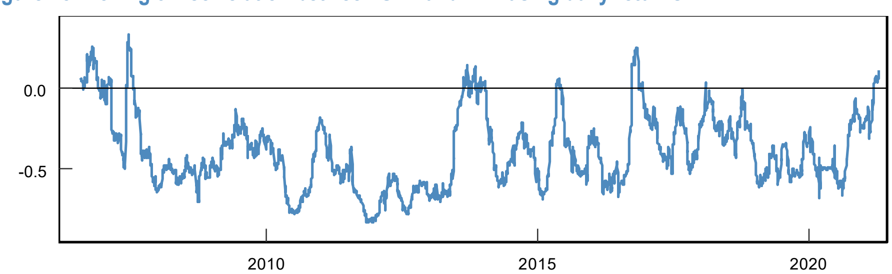
Source: J.P. Morgan Quantitative and Derivatives Strategy

Portfolio construction

What can option implied skew tell us about bond equity correlation?

For much of the last two decades, the correlation between bond and equity returns has been negative. The assumption that the correlation will stay low or negative forms an important foundation for popular asset allocation strategies such as the 60:40 and risk parity. However, we observe significant variations in short term correlation over time and sharp spikes are common.

Figure 15: Rolling 3M correlation between SPY and TLT using daily returns



Source: J.P. Morgan

Therefore, there is value in having a bond/equity correlation forecast that is high frequency and forward looking. In the report What can option implied skew tell us about bond equity correlation? such a measure is proposed, based on information extracted from exchange listed options of the SPY (S&P 500 ETF) and TLT (20Y+ US Treasuries ETF).

The SPY return distribution is almost always left (negative) skewed, indicating that the put wing is overbid, and investors associate SPY downside with the systemic downside risk.

On the other hand, the skewness of the TLT oscillates between positive and negative. When the TLT implied skewness is negative, it means that investors overbid the put wing and associate TLT downside with the systemic downside risk. In turn, this implies a positive correlation between TLT and SPY. When the TLT implied skewness turns positive, it indicates the investors see TLT upside representing the systemic downside risk, implying a negative correlation between TLT and SPY.

The relationship between skew and correlation holds if the sole driver of skew is the systemic factor. Following the work of Chang et al. (2012)[6] it can be shown that the implied correlation is:

$$\rho = \left(\frac{SKEW_{TLT}}{SKEW_{SPY}}\right)^{\frac{1}{3}}$$

Many asset allocation strategies rely on implicit or explicit forecasts of the bond/equity correlation and the whole covariance matrix. Together with the option implied variance of the assets the entire covariance matrix with option implied information can be populated.

While in a two asset portfolio, the risk parity weights in risk parity and the ERC portfolios are identical[7] and function of volatilities, the correlation information is still required for volatility targeting purposes. Below portfolios formed using the 1M implied covariance matrix (i.e. the risk neutral measure) and the 1M realized covariance matrix (the physical measure) are compared. The portfolios are rebalanced monthly, and the results are presented after transaction cost. When adjusted for volatility, the portfolio formed by Risk Neutral parameters outperforms, without exhibiting excess tail risk.

Table 10: Summary statistics of risk parity portfolios

	Physical	Risk Neutral
Return %	13.0	8.5
Volatility %	12.5	7.2
Information Ratio	1.0	1.2
Worst Drawdown %	-18.8	-14.2
Skewness	-0.7	-0.7

Source: J.P. Morgan

Although we target our portfolio volatility to be 10%, the ex-post volatility of the Risk Neutral portfolio is much lower. This is to be expected, since the volatility and correlation premium leads to a more conservative portfolio construction. On the other hand, the realized covariance matrix produces a higher volatility portfolio, indicating that backward looking measures tend to understate the portfolio risk.

Risk premia portfolio construction updates

Previously the cluster portfolios and tail risk parity were introduced as alternatives to the risk parity benchmark. In Enhancing active ETF performance, cluster portfolio and tail risk parity updates, and latest model views the performances YTD of the two approaches have been updated.

Figure 16shows the performances of risk premia portfolios based on various construction methodologies, all targeted to 5% vol. Both the cluster portfolio and the tail risk parity had smaller drawdowns than the risk parity portfolio in March'21. In 2021, the cluster portfolio has delivered higher risk-adjusted returns than the risk parity benchmark. Returns of the tail risk parity portfolio is lower than risk parity in 2021, but so does its expected tail risk and downside deviation.

[6] Chang, Bo Young, Peter Christoffersen, Kris Jacobs and Gregory Vainberg, April 2012, Option-Implied Measures of Equity Risk, Review of Finance, Volume 16, Issue 2

[7] On the properties of Equally-weighted Risk Contribution portfolios, Maillard, Roncalli, and Teiletche, working paper, 2008

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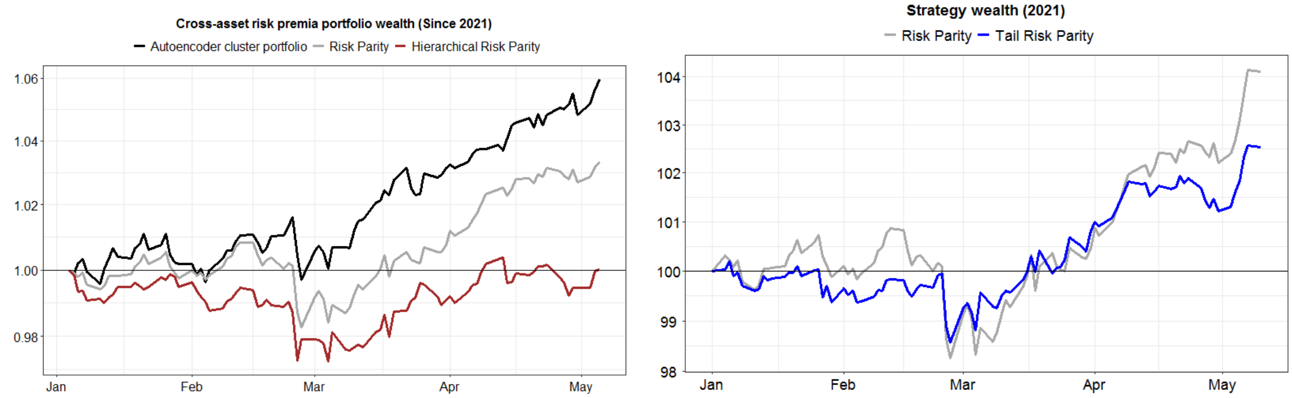
Figure 16: Performance of cluster based portfolio and tail risk parity portfolio compared with risk parity benchmark in 2021



2021	Cum. Returns	Vol	t-stat	Skew	Kurtosis	Max Drawdown
Cluster portfolio	6.8%	5.5%	2.03	-0.78	0.95	1.9%
Risk Parity	3.7%	5.0%	1.23	-1.20	4.30	2.5%
HRP	0.6%	5.2%	0.20	-0.97	4.01	2.7%

2021	Cum. Returns	Vol	Skew	Kurtosis	Max DD	Modified CVaR	Downside deviation
Risk Parity	4.1%	5.1%	-1.20	4.13	2.6%	1.0%	3.7%
Tail Risk Parity	2.5%	4.1%	-0.55	2.95	1.6%	0.7%	2.8%

Source: J.P. Morgan Quantitative and Derivatives Strategy

Balancing factor portfolios to enhance thematic alpha

Risk premia strategies can be used to create a balancing portfolio that complements an active ETF. The overall portfolio is supposed to capture the desired alpha on top of a set of balanced risk parity factor exposures, and is expected to have better risk-adjusted returns over the long run.

In Enhancing active ETF performance, cluster portfolio and tail risk parity updates, and latest model views a sizable Tech theme ETF has been analyzed and it has been investigate if one could mitigate the swings in performance due to its large Momentum exposures, and harvest the stock-selection alpha in the portfolio.

The Tech theme ETF portfolio is decomposed as follows:

$$ETF = ETF\ active + \sum_{j=1}^{5} \omega_j \ \times (Pure\ ERP_j)$$

where ω_j is the Tech theme ETF exposure to a particular pure equity factor j.

Instead of the original factor exposures, a balanced allocation with risk parity weights on each factor is preferred. To do so, we can create a balancing portfolio as a linear combination of 5 investable ERP indices, and complement it to the original Tech theme ETF portfolio. By design, we retain the same alpha which corresponds to specific risk, and ensure equal risk contributions from each of the 5 factors.

$$Balancing\ portfolio = \sum_{j=1}^{5} \left(\omega_j^{Risk\ Parity} - \omega_j\right) \times (Pure\ ERP_j)$$

so that

$$ETF\ balanced = ETF\ active\ + Factor\ portfolio\ (original) + Balancing\ portfolio$$

$$= ETF + Balancing\ portfolio$$

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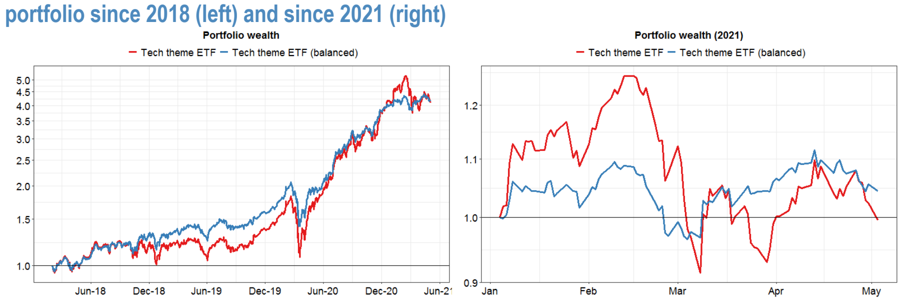
The original factor portfolio (implicitly held in the ETF) suffered from big swings correlated to Momentum's performance, as shown in the latest drop around March. On the other hand, the balancing portfolio is designed to offset such factor volatilities, and its performance is in general negatively correlated to the original factor portfolio.

Figure 17: Performance of the Tech-theme ETF portfolio with/without the factor balancing portfolio since 2018 (left) and since 2021 (right)



Systematic strategies in credit and FX

Value investing in corporate bonds

In the April's Quantitative Perspectives on Cross-Asset Risk Premia, we focus on value factors in credit and the performance of credit value has been compared with its equity counterpart.

The credit Value signal is based on the relative cheapness of an issuer's spread compared to its peer universe. The peer universe is defined to be a cohort of issuers with similar duration and rating profile as the issuer. Every month a cross-sectional regression of the form is carried out:

$$logOAS_{i,t} = c + \beta_D D_{i,t} + \sum_{rat} \beta_{rat} \mathrm{I}_{i,t}^{rat} + \sum_{sec} \beta_{sec} \mathrm{I}_{i,t}^{sec}$$

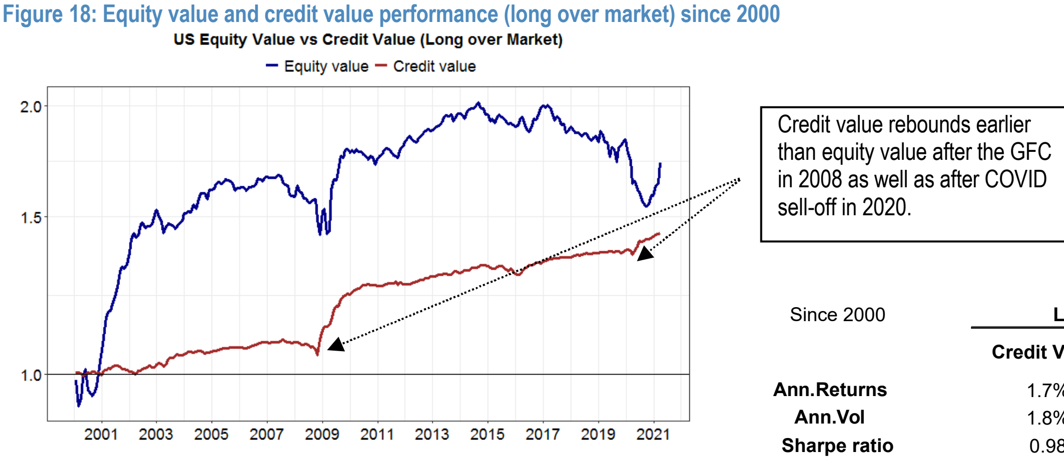
where $OAS_{i,t}$ is the senior spread of issuer i at time t and $D_{i,t}$ is its effective duration. The last two terms are dummy variables to control for the cross-sectional dependence of spreads on ratings and sectors. The summation variable "rat" takes values A, BBB, BB, B and "sec" goes across 18 granular sectors like Energy, Financials, Autos, etc. The regression creates a framework for assigning a fair value spread $OAS_{i,t}^{fair\ value}$ given an issuer's duration, rating and sector. The Value signal is simply the residual from the above regression:

$$Credit\ Value\ Score_{i,t} = \log\left(OAS_{i,t} / OAS_{i,t}^{fair\ value}\right)$$

Issuers with the highest (lowest) value scores enter the top (bottom) quintile Value basket.

Over the past 20 years, value has delivered positive alpha in both credit and equity markets. While both equity and credit value performed very well before 2008, credit value delivers more consistent returns than equity value over the long run with a Sharpe ratio close to 1.0. Both credit and equity value are sensitive to the economic cycles, and suffer from large drawdowns during the GFC in 2008 as well as the COVID sell-off in 2020. However, credit value rebounds from the troughs about 3-6 months earlier than equity value

Figure 18: Equity value and credit value performance (long over market) since 2000



Since 2000	Long over Market	
	Credit Value	**Equity Value**
Ann.Returns	1.7%	2.6%
Ann.Vol	1.8%	6.5%
Sharpe ratio	0.98	0.40

Source: J.P. Morgan Quantitative and Derivatives Strategy

Furthermore, the difference between sector compositions in credit value and equity value has been analyzed with a focus on the past 12 months only. A Brinson attribution analysis has been run to highlight the allocation and selection effects across sectors. The allocation effect shows whether the value portfolio has benefited from an OW or UW of a sector. The selection effect shows the stock or bond picking ability within a certain sector. The sum of the allocation and the selection effects equals the excess return of the Value portfolios relative to the market.

Figure 19 highlights the key differences we observe across credit value and equity value in the recent 12 months following COVID sell-off.

Figure 19: Differences in sector contribution between credit value and equity value

	Credit Value	**Equity Value**
Overall comment	Positive selection effects across all sectors, especially within Energy	Selection effect is weaker, and especially poor within the Technology sector
Energy	UW the market, but very strong bond selection power within the sector, leading to positive performance	Slightly negative performance due to both allocation (small UW) and selection effect
Financials	Large OW leads to outperformance. Selection effect is also good	Positive selection effect, but recent UW leads to negative performance
Technology	Unlike equity value, credit value OW technology. Also there is positive selection effect within the sector	Poor stock selection within sector. Large UW also leads to negative performance

Source: J.P. Morgan Quantitative and Derivatives Strategy

Credit risk premia performance in 2Q and sectoral tilts in the Value basket

In [Factor Tracker: 2Q performance and H2 Outlook] the strong performance of the cyclically positioned multi-factor Integrated and Momentum credit risk premia styles has been highlighted. Both factors were over-weight higher beta and inflation

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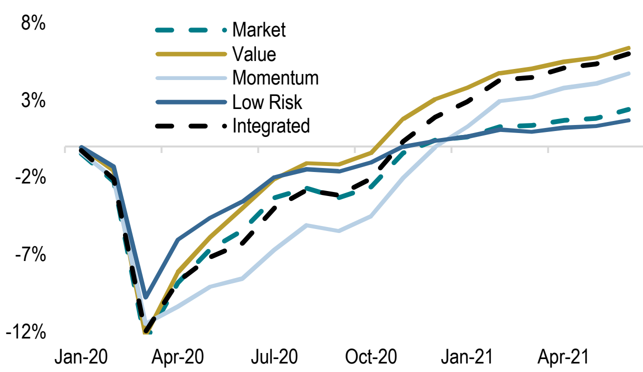
sensitive sectors like Energy, Autos, and Industrials and benefited from rising inflation and the cyclicals led rally in credit markets. Along with Value, all three factors have outperformed the long-only market in 2021 and since January 2020, over a complete market crash and recovery cycle, Figure 20 and Figure 21.

Credit Value, specifically, has had an impressive streak of outperformance over the last year and a half. The sectors where Value continues to find opportunities in the current environment of tight spreads and low dispersion are the sectors where spreads are trading cheap relative to net leverage (a measure of fundamental risk). Table 11 shows that within Euro Investment Grade (IG), Value is OW Autos, Industrials – sectors with low leverage and UW Real Estate and Telcos, sectors with comparatively higher leverage levels. Similarly, in US IG, Value is OW Autos, Transport and UW Utility and Real Estate. We are constructive on credit factors going into H2 and expect continued outperformance from the Momentum and Integrated styles.

Figure 20: Credit Factor long-only cumulative returns vs the market

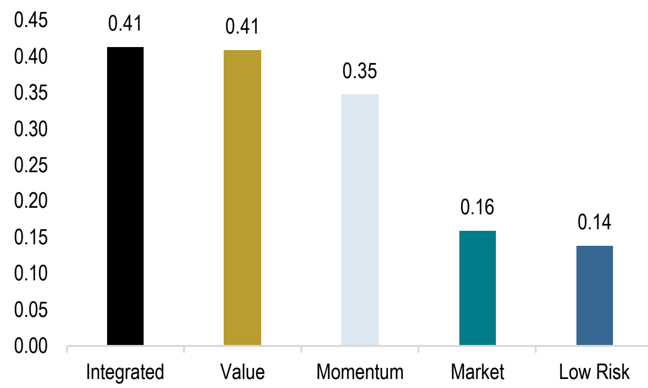
Credit factor returns are for a composite of 40% USIG, 40% Euro IG and 20% USHY. Gross of costs with monthly rebalancing.



Source: J.P. Morgan.

Figure 21: Long-only factor Sharpes January 2020 – June 2021

Calculated from monthly credit excess returns gross of costs



Source: J.P. Morgan.

Table 11: Value factor is OW sectors with high spread to leverage ratio

Spreads are as of June 2021. Leverage metric is Net Debt/EBITDA as of 1Q 2021

Sector	EuroIG weight	EuroIG Spread	EuroIG Lev	EuroIG Sprd/Lev	USIG weight	USIG Spread	USIG Lev	USIG Sprd/Lev
Automotive	4%	48	0.9	53	3%	64	1.0	62
Basic Industry	1%	57	2.1	28	-3%	125	2.6	48
Capital Goods	1%	48	2.0	24	2%	82	2.0	41
Technology & Electronics	0%	42	2.1	20	2%	77	1.7	46
Transportation	0%	65	3.6	18	1%	137	2.1	64
Retail	0%	52	3.0	17	0%	102	2.2	47
Media	0%	63	1.4	45	-1%	105	2.3	45
Utility	0%	58	3.6	16	-2%	140	5.3	26
Healthcare	0%	41	2.3	18	2%	105	2.3	46
Services	-1%	50	4.8	10	-4%	98	2.0	48
Consumer Goods	-1%	50	2.8	18	2%	86	2.2	40
Energy	-1%	62	2.3	27	2%	136	2.9	47
Telecommunications	-2%	49	2.6	19	0%	113	2.7	42
Real Estate	-9%	89	11.2	8	-5%	107	7.0	15

Source: J.P. Morgan.

FX Macro Quant Update: A neutralization across most signals, low yields and little value

The growth signals based on economists' forecasts have been unchanged for more than a quarter and hence the *model has completely neutralized* its pro-cyclical/ USD-bearish position.

This is reflected in the cross-sectional TEAM model which is now neutral USD (from bearish) for the first time in a year as well as in our time-series suite of models for G10, which have reduced exposure as very few signals are currently being triggered; a fresh set of catalysts is required for new direction for FX.

Most activity data are still beating expectations and EASIs are still positive in most countries, so the stabilizaiton on growth forecast does yet not reflect data rolling over.

Looking at the first half of the year, FX carry has eked out positive returns largely from EM (in contrast to last year); returns from growth were modestly negative; value has delivered negative returns for a third consecutive year.

Instead, reflation signals that were not USD-centric—like relative equity momentum, cross-border FDI/ equities flows and commodity RV—were the best signals for global portfolios. Mispricing vs. rates worked well for G10.

Growth signals will still be relevant but are taking an early-stage breather. Our growth model is nearly neutral on high beta FX. Risks are still biased to firming growth judging from data surprises.

A lesson from 2021 is that structural changes in the macro backdrop, i.e. the US fiscal boost, should be accounted for when interpreting model results. USD should not always be considered the default funding currency.

Yields remain low on carry baskets so returns remain contingent on growth. Carry baskets were resilient to higher US yields in Q1 since improving global growth was an important offset.

We continue to downplay value as dispersions are still narrow.

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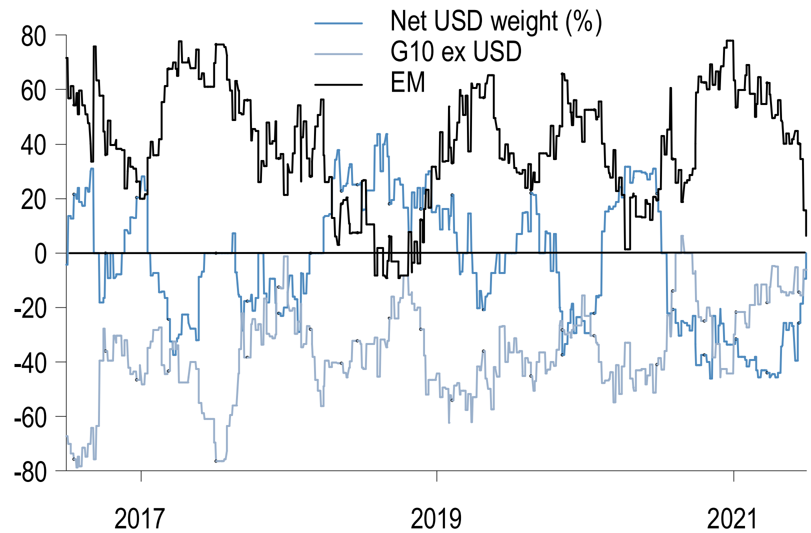
Figure 22: T.E.A.M model has recently neutralized its short position in the broad USD
T.E.A.M cross-sectional sector weights (in %) for the USD, EM and G10 ex USD



Source: J.P. Morgan

Regime detection

The Adaptive Regime Compass: Measuring Equity Market Similarities with ML Algorithms

We highlight a ML-based approach that can be used to locate periods in the past that are similar to the current constellation of macro and financial variables. The ML technique helps to shortlist relevant market drivers from a broader list of variables and investors can make more informed market timing decisions.

From this perspective, the ARC framework can have a wide array of applications, ranging from equity risk scaling, dynamic recommendations for systematic hedging, risk on/off signals for carry strategies to asset allocation, risk premia allocation etc.

It is well recognized that financial investment returns vary greatly in a variety of macroeconomic and market regimes. This empirical experience prompts the development of a quantitative measure of regime similarity. A framework to systematically and scientifically identify regime similarity, i.e. the Adaptive Regime Compass (ARC) has been proposed in Introducing the Adaptive Regime Compass: Measuring Equity Market Similarities with ML Algorithms.

Investors can apply this approach and gauge market environment based on the return distribution and risk profile in similar periods, and can thus navigate across market conditions. Within the ARC framework, a machine learning technique (Random Forest) is leveraged to shortlist relevant market drivers from a broader list of variables concerning market risks, investors' positioning and economic backdrop. By focusing on key dimensions of a dataset that defines a market regime, a distance measure is applied that enables to quantitatively measure similarity to historical periods. The development of a vector representation of the regime as well as the similarity measure can be used to derive a conditional return distribution for financial assets.

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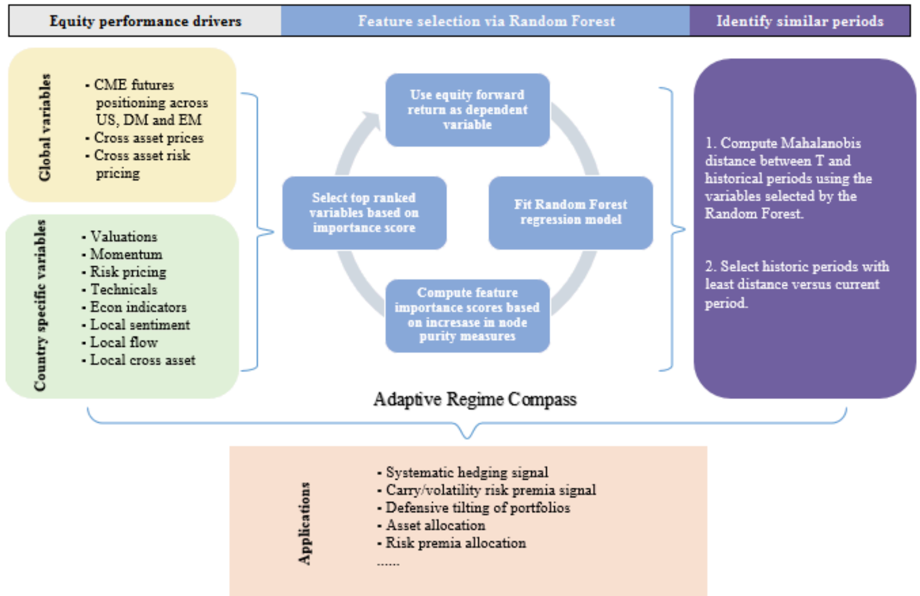
Figure 23: Illustration of the regime identification process by the Adaptive Regime Compass framework



Source: J.P. Morgan Equity Derivatives Strategy

By systematically drawing parallels to historical periods that exhibit similar features, investors can make more informed decisions from a market timing perspective (increasing or decreasing exposure to an underlying asset considering the regime signal) and an asset allocation perspective (rotating into assets that will likely perform better for a given market regime).

From this perspective, the ARC framework can have a wide array of applications, ranging from equity risk scaling, dynamic recommendations for systematic hedging, risk on/off signals for carry strategies to asset allocation, risk premia allocation etc.

As proof of concept, a trading strategy on S&P 500 and Nikkei 225 has been backtested where equity exposure is determined by the distribution of investment returns under similar periods in the past. The analysis shows that adjusting equity exposure in response to outputs of the regime model can materially outperform a benchmark strategy of buy and hold on a risk adjusted basis.

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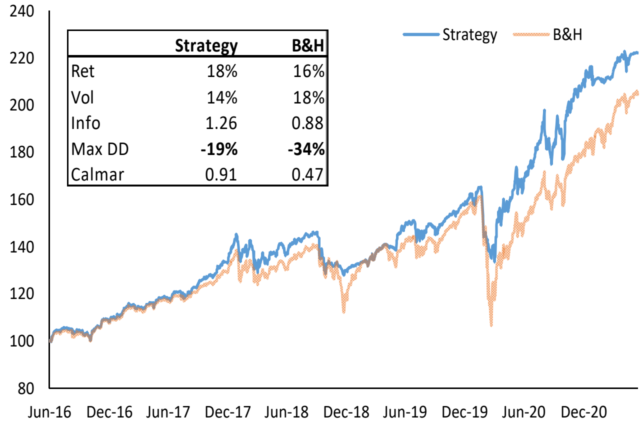
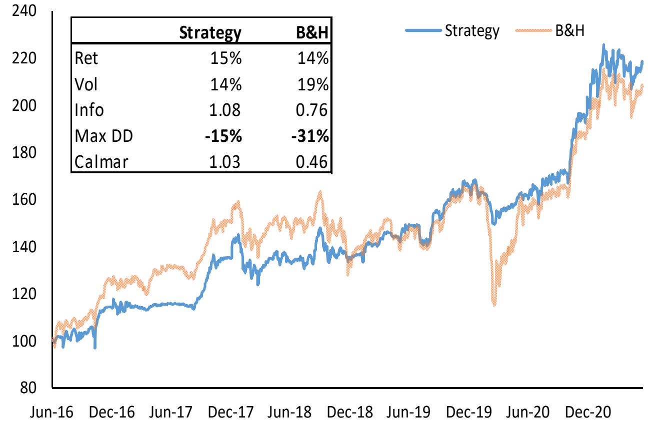
Figure 24: Prototype risk-control strategy performance versus Buy & Hold strategy for the SPX



Source: J.P. Morgan Equity Derivatives Strategy, Bloomberg Finance L.P. * Back-test result is not indicative of future performance. The analysis incorporates 5bps t-cost on monthly rebalances.

Figure 25: Prototype risk-control strategy performance versus Buy & Hold strategy for the NKY



Source: J.P. Morgan Equity Derivatives Strategy, Bloomberg Finance L.P. * Back-test result is not indicative of future performance. The analysis incorporates 5bps t-cost on monthly rebalances.

Distance measure for quantifying market regimes with applications to FX vol trading

In Distance measure for quantifying market regimes for FX vol trading a method for quantifying the perpetual dilemma: which historical periods are similar has been proposed. The market conditions for two time periods are considered similar if the Mahalanobis distance between them is small.

The Mahalanobis distance, a commonly used metric, is essentially a multi-dimensional z-score with the multidimensional vector being a difference between a reference (e.g. today) and another date, and where the components of the vector are various market and economic data points at time T. It can be thought of as a way to compute the distance between two points given some underlying distribution or as a way to compute the distance between a point and a distribution (this is analogous to a standard z-score).

The Mahalanobis distance versus is preferable to the Euclidean distance as in the case of the Mahalanobis distance the impact of highly redundant timeseries is suppressed. The Mahalanobis distance is actually equivalent to the Euclidean distance on the PCA-transformed dataset.

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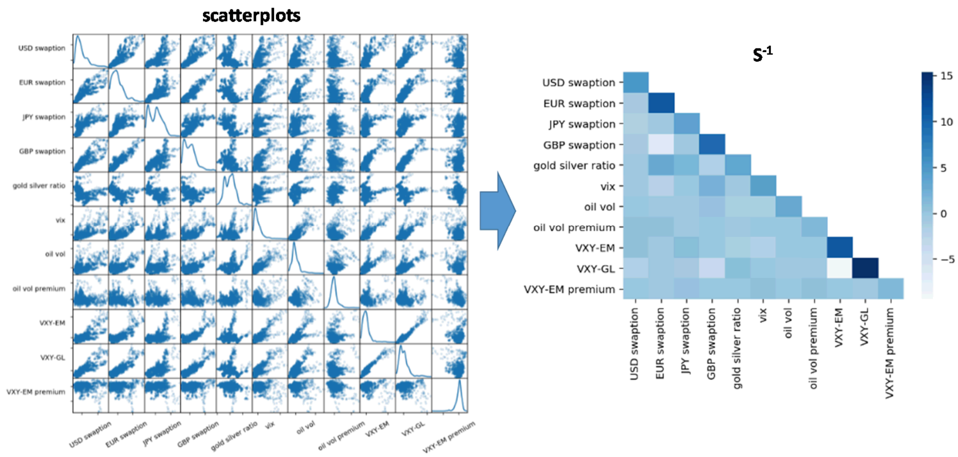
Figure 26: An example of an S^{-1} matrix on an 11 variable basket (aka Global risk markets basket). The strongly negative term in S^{-1} matrix offsets the combined effect of the highly correlated VXY-EM and VXY-GL. A similar though somewhat less detrimental case is seen for EUR and GBP swaptions.



Source: J.P. Morgan

As a proof-of-concept the framework is applied to seven baskets: global risk basket, positioning basket, economics/broad market backdrop basket, three FX vol baskets (USD, EUR and JPY vs G10) and the overall basket that incorporates variables from other six baskets, overweighting FX vols.

The Mahalanobis distance is constrained to the 10%-tile and then a visualization of the similarity between today's market vs. history going back to 2006 is generated. Intuitively correct, we find the current broad market conditions have the smallest distance to the pre-GFC, 2014, 2017-2019 (with interruptions) and finally for the late 2020 period.

Of course there are also some shortcomings to this distance function. The key one is that the covariance is fixed (at least in this implementation) rather than time varying, thus risking going stale if the relationships change over time. Also, there is still the 'outlier problem' since this is a quadratic distance formula. An extreme value in a single component can cause the distance to be extreme which may or may not be a desired part of the model.

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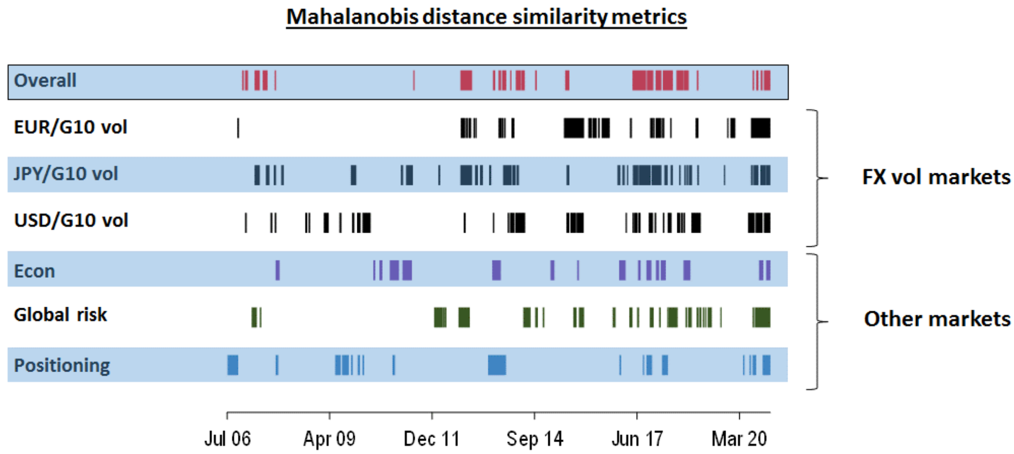
Figure 27: The overall basket highlights similarity of the current backdrop with pre-GFC, 2104, 2017-2019 (w/ interruptions) and finally late 2020. Note that FX vols are overweight in the Overall basket even though Mahalanobis framework tends to suppress redundancies.

Doubles removed from the Overall basket



Source: J.P. Morgan

Thematic investing: global outlook and key themes

Thematic investing is a strategy of investing in new and fast-growing market segments, based on a certain theme, often tied to technological, macroeconomic, regulatory or other developments. These themes often overlap with price momentum, revenue growth, speculative investors' interest, and accelerated institutional and retail flows. Thematic investing hence can be seen as a combination of investing in custom defined, emerging industry sectors and momentum investing. The most common application of thematic investing is in identifying a portfolio of stocks exposed to a perceived 'hot' area. However, the approach can be more systematic in identifying relevant stocks, weighting, risk managing, consideration of valuations, and anticipating inflection points (e.g. to avoid a theme jumping the shark). This is important, as thematic investing often picks up momentum, and can result in unsustainable valuations and subsequent losses for latecomer investors. One example of the risks involved in thematic investing is the popular theme of Solar energy. After a strong run with over 300% gains during the COVID-19 pandemic, these stocks have declined by nearly 50% this year (see here).

With J.P. Morgan's QUEST Thematic Investing framework machine learning and natural language processing (NLP) tools on big data (news-flow) are leveraged to capture a more dynamic and accurate (weighted) representation of themes in the market. Apart from performance, our analytical tools enable us to track developments on the themes (e.g. news volume trend, ETF fund flows), as well as cross-linkages between the themes and signs of crowding. Macro and fundamental considerations are an important part of thematic investing, and we rely on J.P. Morgan's global research to analyze the themes, industry dynamics, and potential changes in the macro environment.

In the report Thematic Investing Handbook Global Outlook and Key Themes 17 investment themes are presented in various areas such as: **Paradigm Shifts -**

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opportunities that are emerging from new business models, technological breakthroughs, etc.; **Secular Growth** – areas where fundamental drivers are well known and relatively steady, but are likely to remain strong for a longer period of time; and **Macro/Market** themes – these aim to capture inflection points in cycles such as the recent surge in commodity prices, geopolitical trends, market-structure issues, etc.

By broader category, themes covered in the report include Digitalization (e.g. Cloud computing, Edge connectivity, Telehealth, Online Gaming, Cybersecurity, Fintech), Innovation (e.g. Electric and Autonomous Vehicles, Blockchain and Cryptocurrencies, Genomic Revolution, etc.), Industry 4.0 (e.g. Robotics and Automation, 3D printing, etc.); Sustainable Resources (Renewable Energy, Water Security, Sustainable Food, etc.); and Macro themes (e.g. Return of Inflation, Commodity Supercycle and Re-opening).

Systematic strategies based on retail trading activities

Retail Order Flow in US Equity Options: Case Studies and Signal Value

In a "A (Sub)Penny Saved" we analyzed retail orders in the US equities market, and confirmed that retail buying is a short term continuation signal. In a subsequent report, we discussed retail trading activity in the US options market in which we briefly explored the use of option order flow as a volatility trading signal. In the report Retail Order Flow in US Equity Options: Case Studies and Signal Value a further look at retail activity in the US options market has been taken, by providing some interesting case studies, and exploring its potential signal value as a complement to retail order flow on cash equities.

Due to the heterogeneity of option contracts, the number of contracts traded and premium paid may not be appropriate representations of option risk. Greeks, such as delta and gamma, are better measures, and allow for a reasonable comparison across securities. A couple of interesting case studies, involving NASDAQ 100 ETF and options, and the VIX index and ETP options, have been examined to better understand retail option trading behaviour.

We find that retail traders utilize options as an alternative and high leverage way of accessing high price stocks and that the option delta imbalances are only weakly correlated with cash equity imbalance on most stocks. Furthermore we find that SPY and QQQ options are used as hedging instruments by retail traders and that retail investors see TQQQ as a substitute for QQQ call options. In addition high retail participation in VIX compared to other index options is due to the small notional for VIX options and the retail investors who trade VIX options are more likely to have intentionally sought out the capability and are likely more informed/sophisticated than those who trade VIX ETP options

Some previous research has shown that informed traders prefer options to take advantage of the high leverage. This begs the question of whether the retail option order imbalance data has any signal value. Finally some results on using retail option activity data as a directional trading signal are shown. The following definition of delta imbalance as the trading signal has been used..

$$NetCall\Delta_t = \$\, Call^{bought}\Delta_t - \$Call^{sold}\Delta_t$$

$$GrossCall\Delta_t = |\$\, Call^{bought}\Delta_t| + |\$Call^{sold}\Delta_t|$$

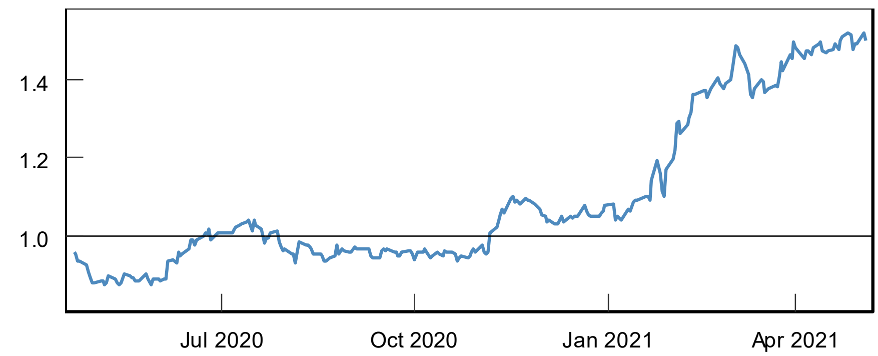
$$NetPut\Delta_t = \$\, Put^{bought}\Delta_t - \$Put^{sold}\Delta_t$$

$$GrossPut\Delta_t = |\$\, Put^{bought}\Delta_t| + |\$Put^{sold}\Delta_t|$$

$$\Delta\, Imbalance_t = \frac{NetCall\Delta_t + NetPut\Delta_t}{GrossCall\Delta_t + GrossPut\Delta_t}$$

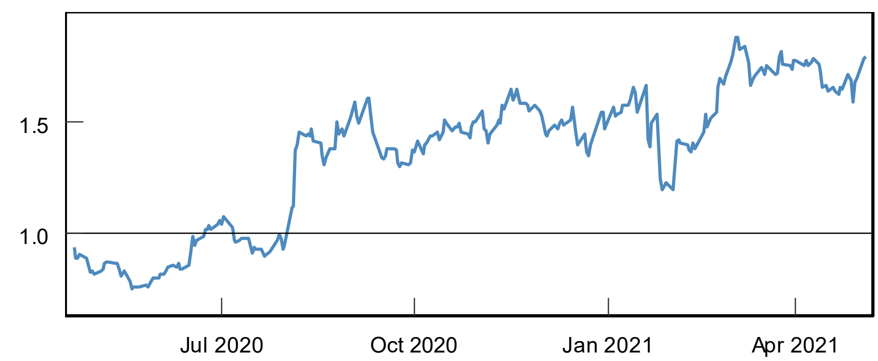
We sort these stocks into deciles by their delta imbalance. Going long the top decile and short the bottom decile produces the performances seen in Figure 28 and Figure 29. It appears that the signaling value decays relatively quickly, as the weekly holding period Sharpe ratio is materially lower than the daily holding period.

Figure 28: Top vs. bottom decile daily holding period(Sharpe = 1.69)



Source: J.P. Morgan

Figure 29: Top vs. bottom decile weekly holding period(Sharpe = 0.55)



Source: J.P. Morgan

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Do Retail Traders Move Commodity Markets? Impacts of Retail Order Flow on Commodity Momentum Strategies

In the report Do Retail Traders Move Commodity Markets? the impacts of retail order flow to on gold (GLD), silver (SLV), and oil (USO) have been studied. The data set contains retail market orders only, and therefore represents liquidity taking activity. At the same time, academic studies have shown that CTA strategies are also takers of market liquidity[8]. We hypothesize that CTA strategies outperform when they provide liquidity to retail investors, and underperforms when they compete for liquidity with retail investors.

To test the hypothesis, we define the daily retail demand/supply imbalance for each ETF as follows and then filter the trades in a prototypical momentum strategy:

$$Imbalance = \frac{Buy\,Volume - Sell\,Volume}{Buy\,Volume + Sell\,Volume}$$

Strategy 1: If the momentum trade direction is positive (negative), then the strategy will go long (short) if the retail flow imbalance is less than .05 (greater than -.05) and stay flat otherwise.

Strategy 2: If the momentum trade direction is positive (negative), then the strategy will go long (short) if the retail flow imbalance is less than 0 (greater than 0) and stay flat otherwise.

Strategy 3: If the momentum trade direction is positive (negative), then the strategy will go long (short) if the retail flow imbalance is less than -.05 (greater than .05) and stay flat otherwise.

Each strategy is more restrictive that the previous one. In the below Figure 30, the results for oil (USO) are shown with the momentum signal being based on 1 week lookback. The additional three curves show a progressive filtering based on the retail flow data.

[8] Kang, Wenjin, Geert Rouwenhourst, Ke Tang, 2020, A Tale of Two Premiums: The Role of Hedgers and Speculators in Commodity Futures Markets, Journal of Finance, Vol 75.1

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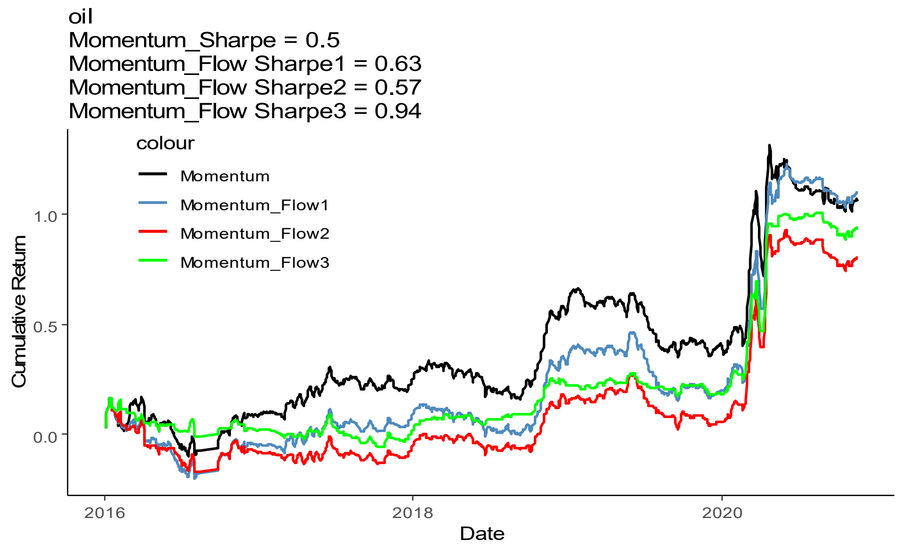
Figure 30: Oil Long/Short Momentum Strategy filtered with Retail Order Flow



Source: J.P. Morgan

Table 12: Backtest results

Oil Long/Short	Mean	Sdev	Sharpe	Drawdown
Momentum	0.23	0.46	0.5	-0.38
Momentum Flow 1	0.29	0.47	0.63	-0.37
Momentum Flow 2	0.28	0.48	0.57	-0.34
Momentum Flow 3	0.51	0.54	0.94	-0.22

Source: J.P. Morgan

It can be seen that the more restrictive strategies tend to provide better Sharpe ratios. Results have been somewhat similar for silver and inclusive for gold.

Furthermore, the retail buying tends to be more coordinated and persistent than retail selling. Therefore the liquidity premium may be more elevated on retail buying flow than selling flow. A separate analysis of the performances of the long and short positons supports this finding.

In the end, the retail flow data has been compared with BBG CFTC data. The correlation between these two is inconclusive and this gives us more confidence in the unique value of our retail flow data.

Structural breaks in equity risk premia

In the report Disentangling momentum and carry in commodities, structural breaks in risk premia and latest model views, the questions of how equity risk premia has evolved over time and whether there have been any structural breaks in the levels of risk premia were analyzed. Break point detection algorithm has been used to find out if equity styles are now commanding lower risk premia compared to historical levels.

First, factor risk premia are estimated by running cross-sectional regressions on monthly excess returns of MSCI World stocks:

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$$
\begin{aligned}
& r_{i,t} - r_{mkt,t} \\
& = \alpha_t + \lambda_{VAL,t} VAL_{i,t-1} \\
& + \lambda_{MOM,t} MOM_{i,t-1} + \lambda_{SIZE,t} SIZE_{i,t-1} + \lambda_{QUAL,t} QUAL_{i,t-1} + \lambda_{VOL,t} VOL_{i,t-1} + \varepsilon_{i,t}
\end{aligned}
$$

where $VAL_{i,t-1}$ is the Value factor loading of stock i at t-1, and similarly for factor loadings on Momentum, Size, Quality and Volatility. The lambdas λ are the estimated monthly risk premia commanded by the corresponding factor.

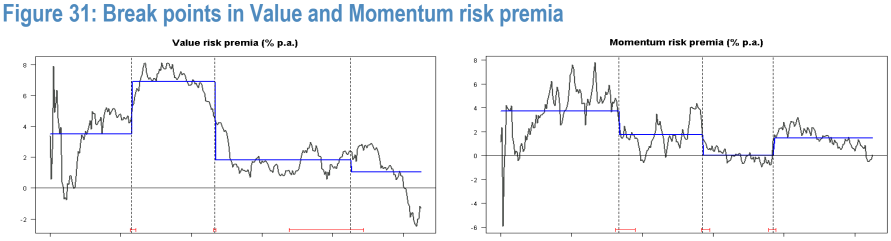
The idea is to detect if the mean of the risk premia has changed significantly after certain dates, which will be identified as structural break points. We consider the recursive residuals from the mean model:

$$\lambda_t = \bar{\lambda}_t + \varepsilon_t$$

It is known that the cumulative sum (CUSUM) of the recursive residuals follows a Brownian motion if the mean is constant. On the other hand, if there is a sudden change in the mean level, the CUSUM process will cross some predefined threshold, indicating the existence of a structural break point. Each structural break is required to last for at least 3 years[9].

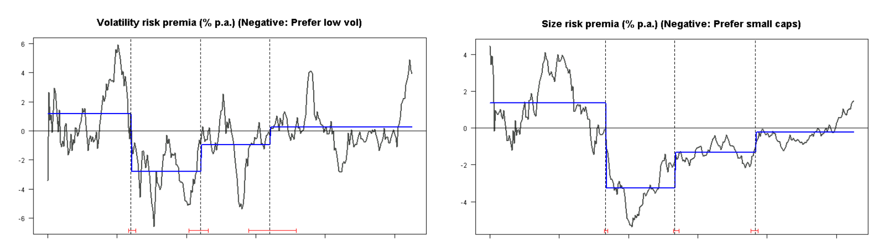
It has been found that the Value risk premium has dropped from a high of 6.9% in early 2000s to 1% p.a. in recent years. Momentum and Quality risk premia are relatively more stable, although both have decreased to about 2% as of latest. There are also increasingly positive premia on large caps and volatile stocks, which is quite similar to what we saw during the dot-com bubble in 2000.

Figure 31: Break points in Value and Momentum risk premia



Period	Value risk premia
1995(1) - 2000(10)	3.5%
2000(11) - 2006(9)	6.9%
2006(10) - 2016(4)	1.8%
2016(5) - 2021(4)	1.0%

Period	Momentum risk premia
1995(1) - 2003(5)	3.7%
2003(6) - 2009(4)	1.7%
2009(5) - 2014(4)	0.0%
2014(5) - 2021(4)	1.5%



[9] The R package strucchange is used to determine the break points in each risk premia.

Period	Volatility risk premia (-ve = prefer low vol)
1995(1) - 2001(1)	1.2%
2001(2) - 2006(1)	-2.8%
2006(2) - 2011(1)	-0.9%
2011(2) - 2021(4)	0.3%

Period	Size risk premia (-ve: prefer small cap)
1995(1) - 2003(5)	1.4%
2003(6) - 2008(5)	-3.3%
2008(6) - 2014(3)	-1.3%
2014(4) - 2021(4)	-0.2%

List of H1'21 reports with focus on systematic investing

Team	Lead AC	Title	Subtitle
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Quantitative Perspectives on Cross-Asset Risk Premia	Risk premia performance review, trend-following in factors and latest model views
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Quantitative Perspectives on Cross-Asset Risk Premia	Quarterly review, Credit value, Synthetic defensive long vol and latest model views
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Quantitative Perspectives on Cross-Asset Risk Premia	Disentangling momentum and carry in commodities, structural breaks in risk premia and latest model views
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Quantitative Perspectives on Cross-Asset Risk Premia	Enhancing active ETF performance, cluster portfolio and tail risk parity updates, and latest model views
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Risk Premia Portfolio Construction via Uncorrelated Clusters	Introducing Autoencoders as an extension of Principal Components
Global Quantitative and Derivatives Strategy	Lorenzo Ravagli	JPM FX - Derivatives Chartpack Notes	RV of OTM strangles as sentiment indicators remain in risk-loving mode
Global FX Strategy	Meera Chandan	T.E.A.M. 2.0*	A time-series multi-factor approach to FX
Global Quantitative and Derivatives Strategy	Berowne Hlavaty	Big Data and AI Strategies	Assessing a range of NLP Transformer Models such as BERT, Electra, Funnel, GPT2, MPNet and variants
Global FX Strategy	Meera Chandan	FX Macro Quant	A neutralization across most signals
Global FX Strategy	Meera Chandan	FX Macro Quant Mid-year Outlook	Low yields and little value meet neutralizing growth momentum
Global Quantitative and Derivatives Strategy	Peng Cheng	Cross Asset Volatility	What can option implied skew tell us about bond equity correlation?
Global Quantitative and Derivatives Strategy	Peng Cheng	Cross Asset Volatility	Systematically monetize bond/equity correlation premium via vanilla options
Global Quantitative and Derivatives Strategy	Peng Cheng	Retail Order Flow in US Equity Options	Case Studies and Signal Value
Global Quantitative and Derivatives Strategy	Thomas J Murphy	Do Retail Traders Move Commodity Markets?	Impacts of Retail Order Flow on Commodity Momentum Strategies
Global Quantitative and Derivatives Strategy	Peng Cheng	Global Equity Derivatives	Optimal Variance Replicating Portfolio
European Credit Strategy and Derivative Research	Shivam Ghosh	Factor Tracker	2Q performance and H2 Outlook
Global FX Strategy	Ladislav Jankovic	FX Derivatives Research Note	Distance measure for quantifying market regimes for FX vol trading
Global FX Strategy	Ladislav Jankovic	FX Derivatives Research Note	Double no-touches go quantum, the first look
Chief Global Markets Strategist	Marko Kolanovic	Thematic Investing Handbook	Global Outlook and Key Themes
Chief Global Markets Strategist	Marko Kolanovic	Market and Volatility Commentary	Outlook remains positive - buy the dip; where are the bubbles and COVID-Green risk
Global Quantitative and Derivatives Strategy	Tony SK Lee	Introducing the Adaptive Regime Compass	Measuring Equity Market Similarities with ML Algorithms
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Risk Premia Investing in the Age of Machines	Investable Strategies with Machine Learning Asset Pricing Models for Global Equities
Global Quantitative and Derivatives Strategy	Berowne Hlavaty	Big Data and AI Strategies	Assessing a range of NLP Transformer Models such as BERT, Electra, Funnel, GPT2, MPNet and variants
Global Quantitative and Derivatives Strategy	Peng Cheng	Inflation Expectation Tracking Equity Baskets	A Pure Equity Factor Approach
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Quantitative Perspectives on Cross-Asset Risk Premia	Hedging rising inflation, trend-following system review, Bitcoin trend-following backtest and latest model views
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Quantitative Perspectives on Cross-Asset Risk Premia	Reviewing 2020 performance, a note on January effect and latest model views
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Quantitative Perspectives on Cross-Asset Risk Premia	Pure ESG factors, new research on risk premia and latest model views
Global Quantitative and Derivatives Strategy	Khuram Chaudhry	ESGQ	ESG Investing - short term vulnerabilities, long term opportunities
Global Quantitative and Derivatives Strategy	Khuram Chaudhry	ESGQ	Solid and consistent returns for ESGQ, concerns about the high correlation to Momentum & Technology

European Credit Strategy and Derivative Research	Shivam Ghosh	Do Good; Get Paid	Estimating ESG Alpha in European Credit
European Credit Strategy and Derivative Research	Shivam Ghosh	Virtue isn't the only reward	Active management under ESG constraints
Global Quantitative and Derivatives Strategy	Khuram Chaudhry	ESG - Environmental, Social & Governance Investing	Introducing the 'Human Capital Factor'
Global Quantitative and Derivatives Strategy	Peng Cheng	A (Sub)Penny Saved	Tracking Retail Trading Activity in US Equities and ETFs
Global Quantitative and Derivatives Strategy	Peng Cheng	Big Data and AI Strategies	Tracking Retail Activity in the US Equity Options Market

Background reports

Team	Lead AC	Title	Subtitle
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	The quest for pure equity factor exposure	How to eliminate the unwanted biases in equity factors?
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Defensive Risk Premia	Systematic Strategies for the Risk-Off Times
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Custom Performance Attribution based on Portfolio Holdings	Decomposing Risk and Return Drivers via Factor-Mimicking Portfolios
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Market-neutral carry strategies	Harvesting carry without market risk
Global Quantitative and Derivatives Strategy	Lorenzo Ravagli	Trading vol-of-vol risk premium	Harvesting smile convexity across asset classes
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Designing robust trend-following system	Behind the scenes of trend-following
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	Quantitative Perspectives on Cross-Asset Risk Premia	Macro-Economic Backdrop, Liquidity in Equity Styles and Tail Risk Parity
Global FX Strategy	Meera Chandan	J.P. Morgan FX single-factor style frameworks	
Global FX Strategy	Meera Chandan	T.E.A.M.*	Introducing a multi-factor approach to FX
Global Quantitative and Derivatives Strategy	Haoshun Liu	AI and Big Data Approach to Thematic Investing	Structural digitalization trends in cloud computing, telehealth, video gaming and cybersecurity
Global Quantitative and Derivatives Strategy	Dobromir Tzotchev	A Quantitative Framework for Cross Asset Style Timing	Machine Learning, Macro and Time-Series models providing views for Portfolio Tilting
Global Quantitative and Derivatives Strategy	Khuram Chaudhry	ESG - Environmental, Social & Governance Investing	Launching JPM's ESGQ - A Quantitative ESG Metric for stock selection models.
Global Quantitative and Derivatives Strategy	Khuram Chaudhry	ESGQ	Is ESG performance simply a measure of long Technology & short Energy?
Global Quantitative and Derivatives Strategy	Peng Cheng	Follow the Robinhood Money	Buying Behavior and Market Impacts of Individual Traders

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