

## Factor Tracker

### Update on Q1 credit factor performance and positioning

- We launch a quarterly publication to track performance of our suite of credit factors – Value, Momentum, Low Risk and Integrated multi-factor baskets introduced previously in [Fact or Fiction](#).
- Credit factors tend to be long volatility and outperform during periods of market weakness and heightened volatility. This is reflected in the performance of our factor baskets this year during the COVID-19 and oil driven market sell-off. Long-short factor returns were strong and positive in Q1 across all factor baskets. The strongest factors were Momentum and Low-Risk followed by Integrated and Value. Performance within long-only baskets was weaker relative to long-short factors. Long only Integrated basket outperformed in IG but lagged the market in HY.
- Within long-only liquid factor baskets that adjust for the sharp drop in Q1 bond liquidity, Low-Risk outperformed, Value and Momentum performed in line with the market and the Integrated factor basket underperformed.
- Latest sector positioning shows that most factor baskets are overweight defensive and non-cyclical sectors. For instance, Integrated factor baskets are OW Telecom, Technology and Utilities and UW Energy, Autos and Leisure.

#### Quantitative Credit Research

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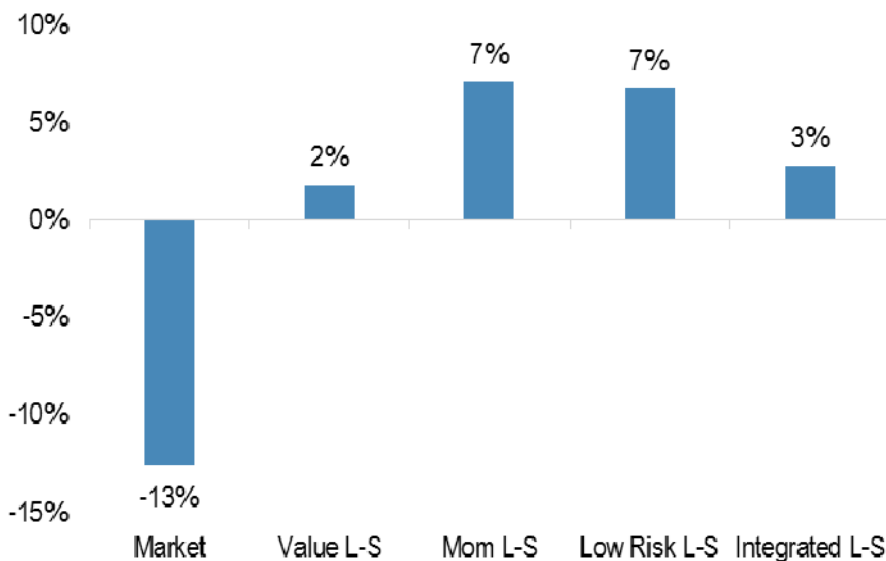
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**Figure 1: Q1 2020 long-short factor performance across EURIG, USIG and USHY**

Long-short(L-S) returns are for aggregated factor baskets across indices with 40% weight in EURIG, 40% in USIG and 20% in USHY. Returns are for top and bottom quintile monthly rebalanced equal weighted portfolios.

Bond returns are in excess of duration matched treasuries



Source: J.P. Morgan.

#### See page 13 for analyst certification and important disclosures.

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## Performance update

In February 2019, we introduced our suite of long-only and long-short credit factors – Value, Momentum, Low-Risk and Integrated (see [Fact or Fiction](#)). Factors provide a systematic way of harnessing structural and behavioural anomalies in credit markets. In this quarterly report, we summarize the Q1 2020 factor performance in the backdrop of the COVID-19 driven global market weakness. For each factor, we review past performance during market risk-off periods, comment on Q1 factor returns, and highlight the latest factor sector positioning.

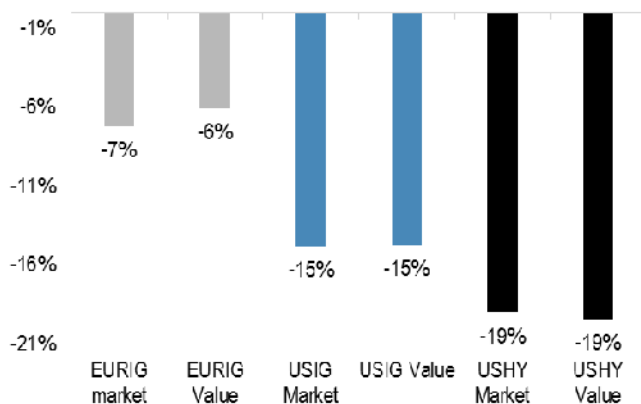
### Value

Value factor trades the dispersion between cheap and expensive bonds. To identify a bond as cheap versus expensive, the strategy compares the bond spread to a fair value spread computed from a model that takes into account spread dependence on bond ratings, maturities, sectors and equity implied issuer default probabilities. The Value factor then goes long or short bonds with spreads that are trading wide or tight relative to fair spreads.

**Q1 2020 Value performance has been in line with the market.** Long-only Value basket returns have been flat relative to the market as seen in Figure 2. A developed market long-only Value portfolio with 40% weight in EURIG, 40% in USIG and 20% in USHY has slightly outperformed the benchmark as shown in Figure 3. Within long-short Value, USHY has had the strongest performance so far with the top quintile basket of cheap bonds significantly outperforming the bottom quintile basket of expensive bonds (see Table 1 in Appendix B: Performance).

**Figure 2: Q1 2020 returns of top quintile Value baskets**

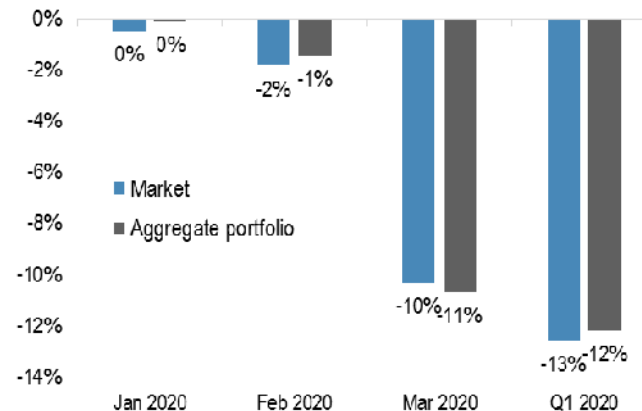
Gross credit excess returns equally weighted portfolios monthly rebalancing



Source: J.P. Morgan.

**Figure 3: Aggregate Value Long-only portfolio versus market**

Aggregate baskets are 40% EURIG, 40% USIG and 20% USHY



Source: J.P. Morgan.

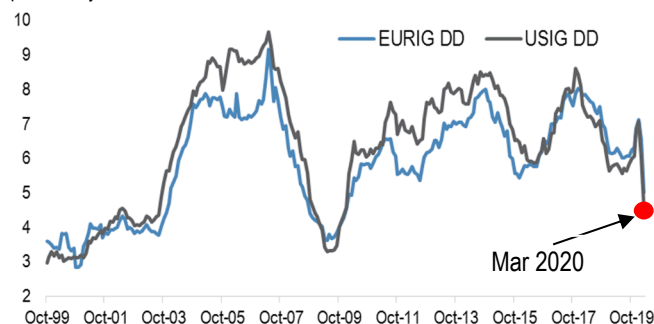
To understand Value's performance so far in the COVID-19 driven market sell-off, we review its return profile through historical drawdown-recovery cycles. Episodes of significant bursts in market volatility such as the 2001-2002 tech bubble and 2008-2009 GFC lead to re-calibration of fundamental company valuations. For instance, during such periods of high volatility, 'Distance to Default' – a fundamental measure of an issuer's probability to default on outstanding company debt, plunges and recalibrates to historical lows as shown in Figure 4 signaling a jump in issuer default probabilities.

As company fundamentals price in new risks, cash bonds revert to match new valuations with a lag due to market frictions. This lag creates a window of opportunity for strategies like Value to step in and identify bonds that have cheapened relative to valuations. Value is likely to underperform during this period because it holds securities that on average have fallen more in price relative to the market. In contrast, during a market rebound, cheap securities in the Value basket mean revert to catch up with their “fair value” generating a positive price action. Thus, **Value underperforms in a drawdown but is expected to outperform during recovery.**

Empirical evidence for Value’s relative under-performance in drawdown versus recovery during the Tech bubble and GFC is shown in Figure 5. For each crisis period, we plot Value long-short monthly returns versus market returns during the crisis sell-off and recovery months. During each crisis period, we observe an improvement in Value factor returns as the market recovers and returns become positive following a drawdown. Also shown via red triangles are Value long-short basket returns during the current COVID-19 crisis.

**Figure 4: Distance to Default ('DD') through time**

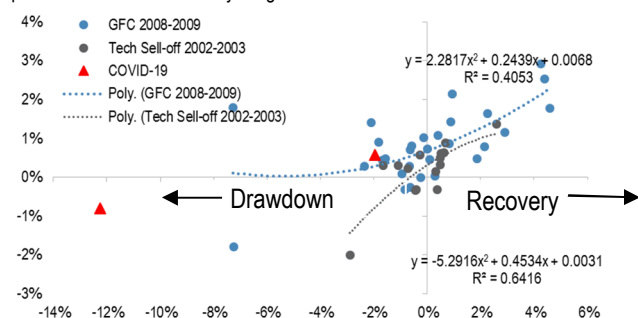
Distance to Default for each month is the cross-sectional median of company specific DD values in USIG and EURIG. Small values indicate higher probability of default.



Source: J.P. Morgan.

**Figure 5: Long-short USIG Value performance during drawdown and recovery periods – Tech sell-off 2001-2002 and GFC 2008-2009**

Horizontal axis – Monthly index returns during drawdown and recovery periods. Vertical – monthly long-short Value returns



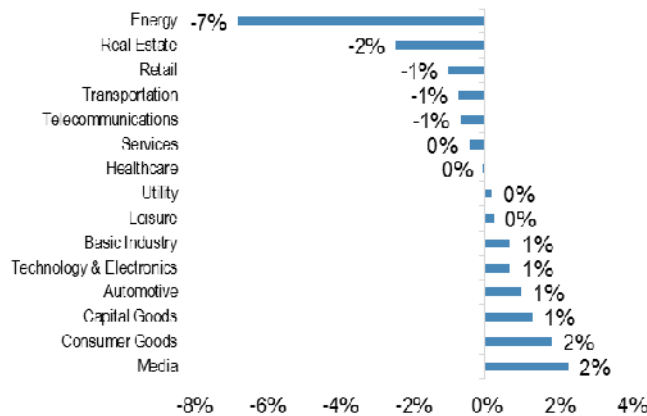
Source: J.P. Morgan.

Although long-only Value portfolios failed to generate any significant excess returns, long-short Value baskets especially in USHY outperformed in March. USHY top quintile Value basket outperformed the bottom quintile basket resulting in a gross alpha<sup>1</sup> of 65bps during March as shown in Table 2. Drivers of USHY Value outperformance in March were active sector allocations. As of February end rebalancing, USHY Value long-short portfolio was OW Media, Basic Industry and Tech and UW Energy and Retail. Going into March, Media and Tech outperformed whereas Energy and Retail sectors lagged the index. We saw similar trends in EURIG and USIG. Figure 7 shows a simple regression of sector returns for our aggregate 40% EURIG, 40% USIG and 20% USHY benchmark portfolio in March versus sector allocations in the aggregated long-short Value baskets. The strong positive correlation between sector returns and Value basket allocations highlights that on average, OW sectors within the long-short Value basket outperformed and UW sectors lagged.

<sup>1</sup> Alpha is defined as the intercept of a regression of monthly long-short factor returns versus the market. Alpha is the part of factor return that does not come from market duration risk

**Figure 6: Aggregate Value Active sector weights as of end Feb 2020**

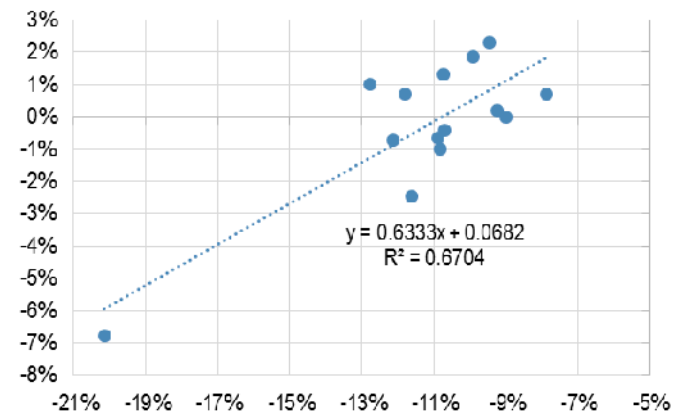
Active weights are calculated as the difference in sector weights of the top quintile and bottom quintile Value baskets



Source: J.P. Morgan.

**Figure 7: Aggregate Sector returns versus Value active weights**

Horizontal: Active Value sector weights as of Feb 2020 end rebalancing,  
Vertical: Sector returns in March 2020



Source: J.P. Morgan.

## Momentum

Momentum factor captures price trends in credit markets by going long past winners and short past losers. Our Momentum signal is based on short-term (3 months) past equity and credit returns of the bond issuer (see Appendix A: Factor definitions).

**Q1 Momentum performance has been strong.** Long-only Momentum baskets have outperformed the market in EURIG and USIG as shown in Figure 8. Across all indices, long-only top quintile Momentum baskets have outperformed bottom quintile portfolios while our aggregated long-short Momentum baskets (40% EURIG, 40% USIG and 20% USHY) have generated Q1 excess return of 7%<sup>2</sup> versus the benchmark as shown in Figure 9.

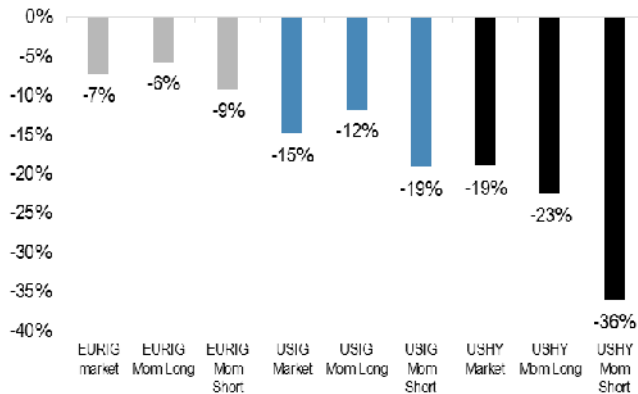
Momentum outperformance was driven by the COVID-19 and oil led sell-off which created a strong divergence in returns across IG sectors. In EURIG, defensive sectors like Utilities outperformed while Energy and cyclical sectors like Auto and Leisure underperformed in February as shown in Figure 10. Momentum portfolios rebalanced as of end February<sup>3</sup> reflected this divergence in performance via active sector over and under-weights shown in Figure 11. As the weakness in cyclical sectors persisted into March, EURIG Momentum outperformed with its defensive positioning – EURIG top quintile portfolio was down -5.0% relative to -8.9% bottom quintile returns in March (see Table 1 in Appendix B: Performance). USIG and USHY Momentum long-short baskets also showed strong performance in March benefitting from OW to Technology and UW to Energy as shown in Figure 11.

<sup>2</sup> Excess returns are not duration neutral to the benchmark. Long-short portfolio is net short in duration relative to the benchmark and therefore a significant fraction of the excess return comes from market directionality. Duration neutral long-short returns are also positive but smaller in magnitude, see Table 2.

<sup>3</sup> Momentum portfolios as of end January were already defensively positioned. For example, USIG Momentum as of end January was UW Autos, Energy and Retail and OW Tech and Telecom. So, if Momentum baskets could not be rebalanced as of end February due to liquidity, March performance of January end rebalanced long-short Momentum baskets would still have been positive but weaker in comparison to February end rebalancing.

**Figure 8: Momentum top and bottom quintile Q1 2020 returns**

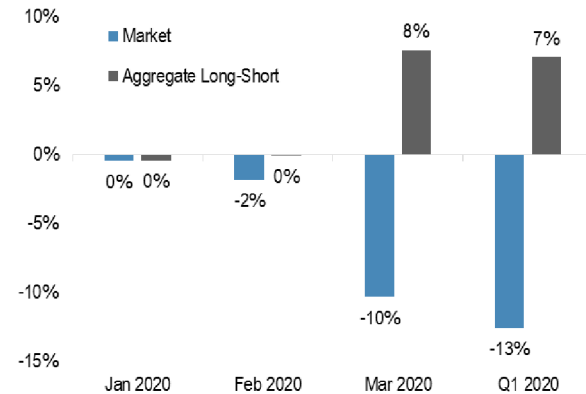
Gross credit excess returns equally weighted monthly rebalanced portfolios



Source: J.P. Morgan.

**Figure 9: Aggregate Momentum Long-Short portfolios versus market**

Aggregate baskets are 40% EURIG, 40% USIG and 20% USHY



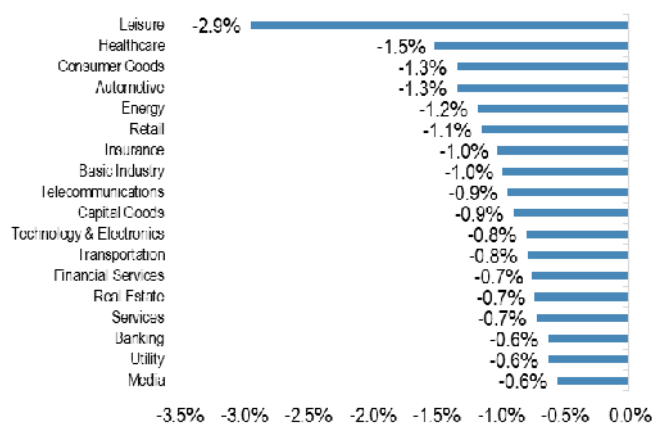
Source: J.P. Morgan.

Strong Momentum long-short returns were driven by the short side of the basket relative to the long side. During drawdowns when there is strong downward momentum trend in markets, the strategy is better suited at picking losers compared to winners and the short bottom quintile basket drives strategy alpha. This reverses during market recovery when an upward trend gets established and the contribution to strategy alpha rotates from the short to the long basket of winners.

Value-Momentum correlations across all bond universes are close to historical lows. Long-short Value-Momentum 12m correlation was close to -50% as of end March (see Table 3). Historically, the Integrated multi-factor portfolio has outperformed during such low correlation regimes. This continues to be the case in March as we will see in the next few sections.

**Figure 10: EURIG Feb sector returns**

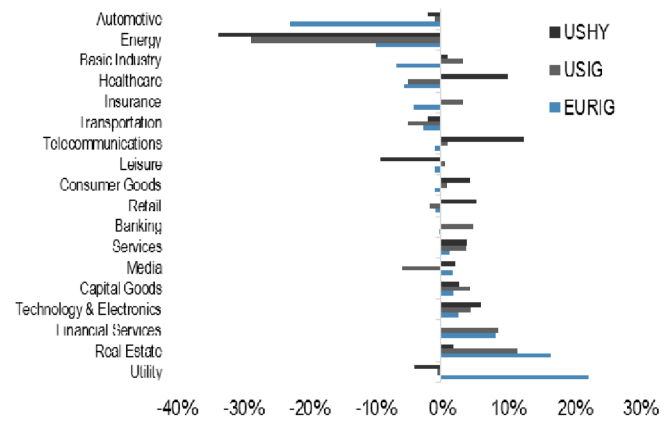
EURIG SENR ICE BAML February 2020 credit excess returns by sector. Market return in February was -1.05%.



Source: J.P. Morgan.

**Figure 11: Sector OW/UW in long-short Momentum baskets**

Sector difference in weights in top and bottom quintile portfolios. Sectors with positive weights are OW and with negative weights are UW



Source: J.P. Morgan.

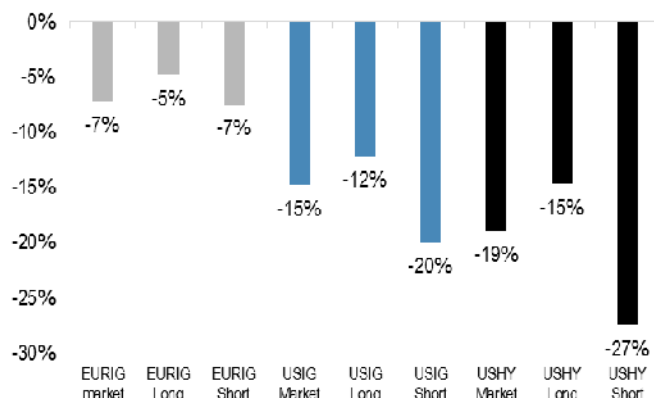
## Low Risk

Low-Risk basket is tilted towards high quality bonds. The factor incorporates a range of balance sheet metrics to identify high quality bonds issued by safe and profitable firms (see Appendix A: Factor definitions for details of factor construction). Low Risk factor outperforms during periods of drawdown and heightened market volatility. As an example, Figure 14 shows cumulative returns through time of the USHY Low-Risk factor relative to the market index. The factor has historically outperformed during economic contraction cycles shaded in grey in the figure.

**Low Risk top quintile baskets across all bond universes outperformed the market during Q1.** Figure 12 shows market top and bottom quintile Q1 returns by bond universe. For each universe, the top quintile high quality bonds outperformed the market and the bottom quintile underperformed. Consequently, **long-short Low Risk baskets had strong returns in Q1 2020.** Figure 13 shows a 7% gross out-performance of Low-Risk baskets aggregated across bond universes versus the long only benchmark. We next look at drivers of Low-Risk outperformance.

**Figure 12: Low Risk top and bottom quintile Q1 2020 returns**

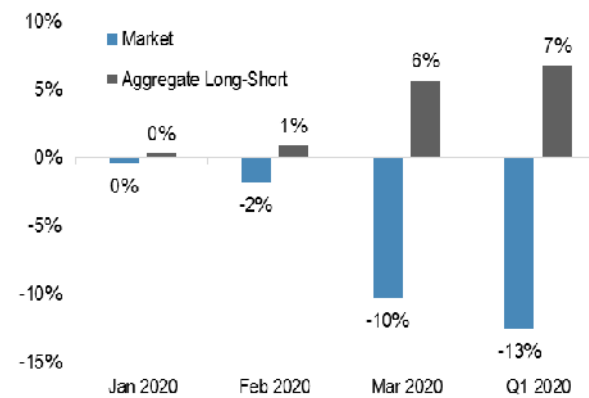
Gross credit excess returns equally weighted monthly rebalanced portfolios



Source: J.P. Morgan.

**Figure 13: Aggregate Low-Risk Long-Short portfolios versus market**

Aggregate baskets are 40% EURIG, 40% USIG and 20% USHY



Source: J.P. Morgan.

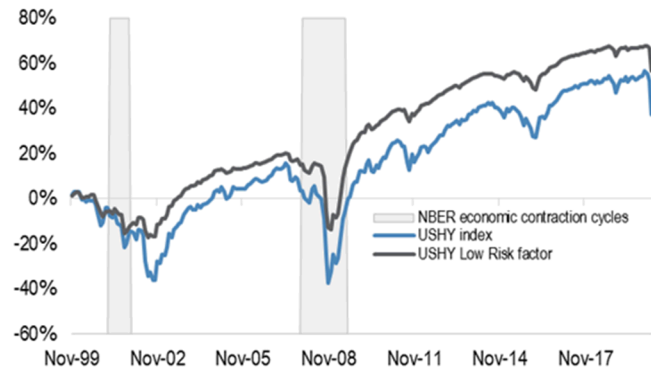
EURIG Low Risk long-short returns in March benefited from OW's to non-cyclical sectors (Utility, Healthcare, Telecom) and an UW to Energy (see Figure 15). USIG March performance was driven by OW to Telecom and an UW to Energy. The OW to Autos and UW to Banking and Tech detracted from performance but overall performance was still positive. USHY Low Risk long-short basket outperformed in March due to OW's in Technology, Telecom and Healthcare and UW's in Energy, Leisure, Retail and Autos.

We note that in defining our Low Risk factor we excluded short duration as a measure of risk. Doing so helps us ensure that factor performance originated from selection of safe and profitable firms as opposed to short duration or low volatility. Adding duration as a low Risk metric further improves performance of the long-short Low Risk baskets.

We next review Q1 performance of the Integrated multi-factor basket. The Integrated portfolio selects bonds that are most attractively placed at the cross-section of Value, Momentum and Low-Risk.

**Figure 14: USHY Low-Risk top quintile factor versus market index**

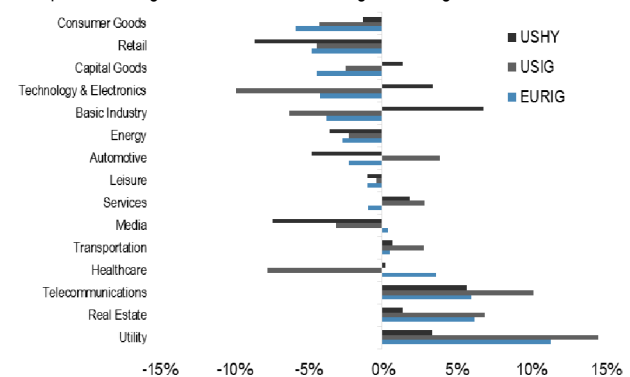
Gross of cost long-only returns for the period Nov 1999 – Mar 2020



Source: J.P. Morgan.

**Figure 15: Sector OW/UW in long-short Low Risk baskets**

Sector difference in weights in top and bottom quintile portfolios. Sectors with positive weights are OW and with negative weights are UW



Source: J.P. Morgan.

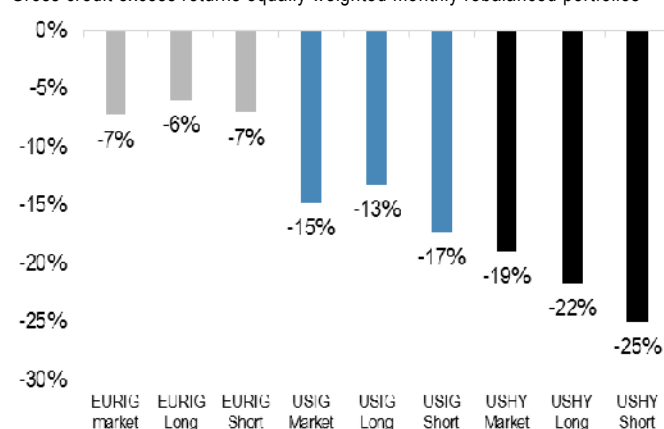
## Integrated

The integrated factor is a multi-factor portfolio consisting of bonds that have the highest aggregate scores across Value, Momentum and Low Risk factors. The portfolio therefore contains bonds that benefit from diversification and low correlation across factors. Integrated historical long-short cumulative gross alphas for the three bond universes is shown in Figure 18. We find evidence for significant alpha pick-up during risk-off and high volatility periods, most notably during the 2008-2009 GFC period.

**Integrated long-only portfolios have outperformed in IG but underperformed the market in USHY. For long-short portfolios we find outperformance in Q1 across all bond universes.** Figure 16 and Figure 17 summarize the performance of long-only and long-short baskets, respectively. The aggregate long-short basket had a Q1 gross return of 3% versus the market return -13%.

**Figure 16: Integrated top and bottom quintile Q1 2020 returns**

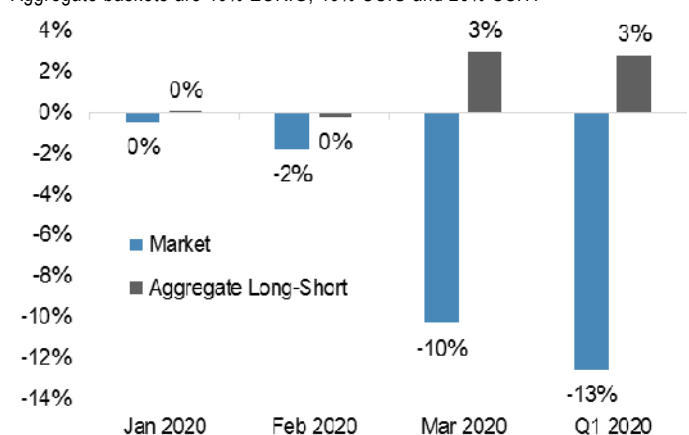
Gross credit excess returns equally weighted monthly rebalanced portfolios



Source: J.P. Morgan.

**Figure 17: Aggregate Integrated Long-Short versus market**

Aggregate baskets are 40% EURIG, 40% USIG and 20% USHY

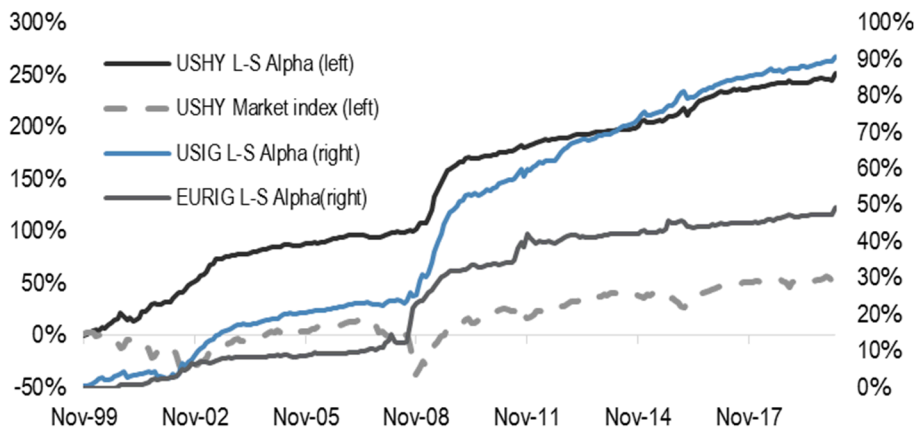


Source: J.P. Morgan.



**Figure 18: Cumulative long-short integrated gross factor alphas for EURIG, USIG and USHY**

Monthly rebalanced equal weighted portfolios. Alphas are calculated from monthly credit returns.



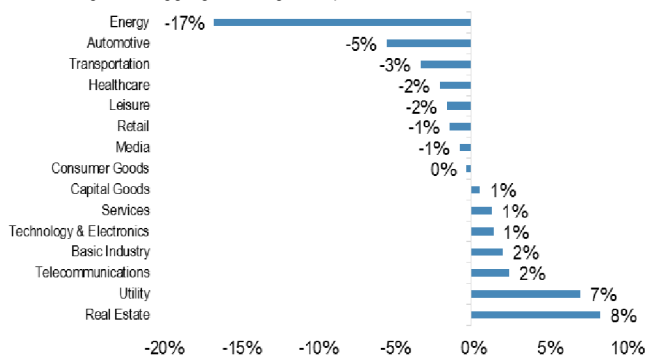
Source: J.P. Morgan.

Sector allocations in the 40% EURIG, 40% USIG and 20% USHY aggregate Integrated long-short baskets showed a strongly defensive and non-cyclical positioning as of February 2020 end rebalancing. Figure 19 shows strong OW's in Real Estate, Utility, Telecom, Technology and Services and UW's in Energy, Autos, Transport and Leisure.

In summary, **while long-only performance across factors was mixed, long-short factors have had a strong Q1**. Figure 20 summarizes long-short factor returns which range from 7% for Momentum and Low Risk, to 2% for Value and 3% for the Integrated factor. These returns are not market neutral and include contributions from differences in duration profiles of the long and short baskets. Market neutral returns are summarized in Table 2 in Appendix B: Performance.

**Figure 19: Sector OW/UW in long-short Integrated basket**

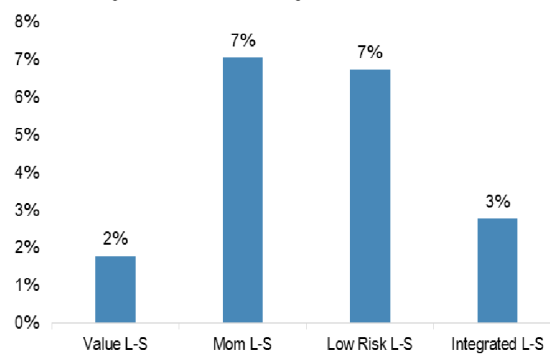
Sector weights in Aggregate Integrated portfolio



Source: J.P. Morgan.

**Figure 20: Factor performance summary**

Q1 2020 long-short factor returns gross of costs



Source: J.P. Morgan.

We next highlight performance of long-only liquid factor baskets.

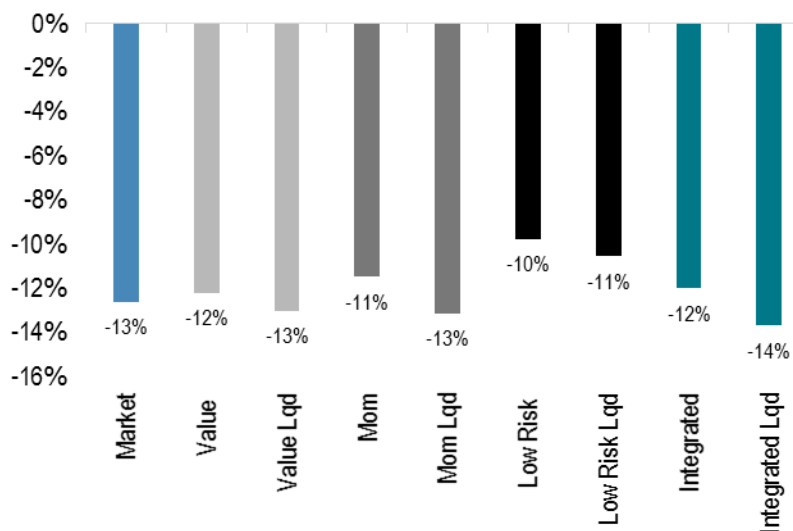


## Performance of long only liquid factor portfolios

In this section, we examine whether real world constraints of long-only portfolios and liquidity degrades performance of long-short factor baskets. Given the sharp drop in bond liquidity during the COVID-19 sell-off, we adopt a conservative approach and impose severe liquidity constraints<sup>4</sup> on our available cross-section for constructing factor baskets. Results are summarized in Figure 21 and Table 4. **We find Low Risk long-only basket continues to outperform after adjusting for liquidity, Value and Momentum perform in line with the market and the Integrated factor basket underperforms.**

**Figure 21: Comparison of long-only performance relative to the market and liquid versions for Aggregate factor baskets across indices.**

Factors created within a liquid pool are suffixed 'Lqd'. All returns are gross of costs. Aggregate baskets are created by weighting EURIG index by 40%, USIG by 40% and USHY by 20%



Source: J.P. Morgan.

<sup>4</sup> We use 1 week trading volume from TRACE for USIG. For EURIG and USHY we use a combination of bond notional outstanding and the age of the bond - younger bonds with large outstanding notionals are more liquid compared to older bonds with smaller notionals. Based on these liquidity metrics we discard the lowest tercile of bonds with the worst liquidity scores and construct factor baskets in the top two-thirds of the available cross-section.

## Appendix A: Factor definitions

**Value** – Our Value score is a composite signal based on two cross-sectional regressions. The first is a regression of spreads versus bond ratings, maturity, 3 month change in bond spreads and country of risk and sector flags. This regression attempts to find a fair value model for bond spreads given the above bond specific parameters. The Value score is the z-score of percentage difference between actual and fair value spreads. The second regression replaces bond ratings with Merton's Distance to Default ('DD') which is an equity implied metric of an issuer's probability to default. The final score is the average of the z-scores from each of the two regressions. For private issuers where the DD metric is unavailable, we proxy the Value score from the second regression to be a multiple of the first regression's Value score as detailed in [Fact or Fiction](#).

**Momentum** – Momentum score is a composite of past 3-month issuer credit excess, credit notional and equity returns. Issuer credit returns are calculated as the weighted average bond return over return of duration matched treasuries of all bonds belonging to the issuer and available in the monthly composition files from ICE BAML. Bond weights are proportional to the market value of the bond in the index.

**Low-Risk** - A composite signal built from a series of market and balance sheet metrics. Market measure of Low-Risk is simply duration. Bonds with short duration get a higher Low-Risk score compared to bonds with longer duration. Balance sheet metrics can be grouped into 'Safety' and 'Profitability'. Safety measures include Distance to Default, Return on Equity (RoE) and Return on Asset (RoA) volatility as proxies for balance sheet volatility, Leverage ratio, Net Debt to EBITDA and Interest Coverage. Profitability metrics include Gross Profitability, RoE and RoA. See [Fact or Fiction](#) for further details on balance sheet definitions.

**Integrated** – Bond specific integrated scores are simple averages of Value, Momentum and Low Risk bond z-scores.

## Appendix B: Performance

**Table 1: Q1 2020 and 2019 factor returns for top and bottom quintile baskets**

Credit gross returns in excess of duration matched treasuries for top and bottom quintile equal weighted factor portfolios rebalanced monthly

| Value      |        |              |                 |        |              |                 |        |              |                 |
|------------|--------|--------------|-----------------|--------|--------------|-----------------|--------|--------------|-----------------|
| Period     | EURIG  |              |                 | USIG   |              |                 | USHY   |              |                 |
|            | Market | Top Quintile | Bottom Quintile | Market | Top Quintile | Bottom Quintile | Market | Top Quintile | Bottom Quintile |
| Mar 2020   | -6.2%  | -5.7%        | -5.8%           | -12.3% | -13.4%       | -12.6%          | -14.7% | -15.3%       | -20.8%          |
| Feb 2020   | -1.0%  | -0.6%        | -1.2%           | -2.0%  | 0.0%         | -1.9%           | -3.1%  | -3.1%        | -3.4%           |
| Q1 2020    | -7.2%  | -6.0%        | -6.8%           | -14.8% | -14.7%       | -15.3%          | -19.0% | -19.4%       | -25.6%          |
| 2019       | 4.8%   | 4.4%         | 3.4%            | 5.9%   | 6.7%         | 3.3%            | 9.6%   | 9.4%         | 7.7%            |
| Momentum   |        |              |                 |        |              |                 |        |              |                 |
| Period     | EURIG  |              |                 | USIG   |              |                 | USHY   |              |                 |
|            | Market | Top Quintile | Bottom Quintile | Market | Top Quintile | Bottom Quintile | Market | Top Quintile | Bottom Quintile |
| Mar 2020   | -6.2%  | -5.0%        | -8.9%           | -12.3% | -9.6%        | -18.0%          | -14.7% | -17.8%       | -30.9%          |
| Feb 2020   | -1.0%  | -0.9%        | -0.5%           | -2.0%  | -1.5%        | -1.2%           | -3.1%  | -3.6%        | -4.5%           |
| Q1 2020    | -7.2%  | -5.7%        | -9.2%           | -14.8% | -11.7%       | -19.1%          | -19.0% | -22.5%       | -36.1%          |
| 2019       | 4.8%   | 5.1%         | 4.4%            | 5.9%   | 4.1%         | 6.7%            | 9.6%   | 7.8%         | -0.6%           |
| Quality    |        |              |                 |        |              |                 |        |              |                 |
| Period     | EURIG  |              |                 | USIG   |              |                 | USHY   |              |                 |
|            | Market | Top Quintile | Bottom Quintile | Market | Top Quintile | Bottom Quintile | Market | Top Quintile | Bottom Quintile |
| Mar 2020   | -6.2%  | -4.4%        | -6.8%           | -12.3% | -10.8%       | -16.9%          | -14.7% | -12.1%       | -23.0%          |
| Feb 2020   | -1.0%  | -0.6%        | -0.9%           | -2.0%  | -1.3%        | -2.4%           | -3.1%  | -2.2%        | -3.7%           |
| Q1 2020    | -7.2%  | -4.8%        | -7.5%           | -14.8% | -12.2%       | -20.0%          | -19.0% | -14.7%       | -27.4%          |
| 2019       | 4.8%   | 4.0%         | 4.8%            | 5.9%   | 4.7%         | 6.7%            | 9.6%   | 9.2%         | 4.6%            |
| Integrated |        |              |                 |        |              |                 |        |              |                 |
| Period     | EURIG  |              |                 | USIG   |              |                 | USHY   |              |                 |
|            | Market | Top Quintile | Bottom Quintile | Market | Top Quintile | Bottom Quintile | Market | Top Quintile | Bottom Quintile |
| Mar 2020   | -6.2%  | -5.2%        | -6.2%           | -12.3% | -11.4%       | -15.1%          | -14.7% | -16.2%       | -21.5%          |
| Feb 2020   | -1.0%  | -1.0%        | -0.9%           | -2.0%  | -1.5%        | -1.9%           | -3.1%  | -4.3%        | -2.6%           |
| Q1 2020    | -7.2%  | -5.9%        | -7.0%           | -14.8% | -13.2%       | -17.4%          | -19.0% | -21.7%       | -25.0%          |
| 2019       | 4.8%   | 5.5%         | 3.7%            | 5.9%   | 5.7%         | 4.9%            | 9.6%   | 10.0%        | 6.8%            |

Source: J.P. Morgan.

**Table 2: Gross and Net alphas for long-short factor baskets**

Long-Short factor alpha is calculated by adjusting long-short returns to be market neutral. Net alphas assume round trip transaction costs of 40bps in IG and 100bps in HY

| Value      |             |           |             |           |             |           |
|------------|-------------|-----------|-------------|-----------|-------------|-----------|
| Period     | EURIG       |           | USIG        |           | USHY        |           |
|            | Gross Alpha | Net alpha | Gross Alpha | Net alpha | Gross Alpha | Net alpha |
| Mar 2020   | -0.15%      | -0.37%    | 0.07%       | -0.18%    | 0.65%       | -0.23%    |
| Feb 2020   | 0.14%       | -0.08%    | 0.17%       | -0.08%    | 0.00%       | -0.88%    |
| Q1 2020    | 0.18%       | -0.49%    | 0.87%       | 0.12%     | 1.03%       | -1.61%    |
| Momentum   |             |           |             |           |             |           |
| Period     | EURIG       |           | USIG        |           | USHY        |           |
|            | Gross Alpha | Net alpha | Gross Alpha | Net alpha | Gross Alpha | Net alpha |
| Mar 2020   | 0.98%       | 0.53%     | 0.72%       | 0.18%     | 1.70%       | 0.72%     |
| Feb 2020   | 0.09%       | -0.36%    | 0.02%       | -0.52%    | -0.39%      | -1.37%    |
| Q1 2020    | 0.98%       | -0.37%    | 0.07%       | -1.57%    | 0.20%       | -2.74%    |
| Low Risk   |             |           |             |           |             |           |
| Period     | EURIG       |           | USIG        |           | USHY        |           |
|            | Gross Alpha | Net alpha | Gross Alpha | Net alpha | Gross Alpha | Net alpha |
| Mar 2020   | 0.19%       | 0.08%     | 0.18%       | 0.12%     | 0.86%       | 0.50%     |
| Feb 2020   | 0.07%       | -0.04%    | 0.24%       | 0.18%     | -0.27%      | -0.63%    |
| Q1 2020    | 0.21%       | -0.12%    | 0.80%       | 0.61%     | 0.02%       | -1.06%    |
| Integrated |             |           |             |           |             |           |
| Period     | EURIG       |           | USIG        |           | USHY        |           |
|            | Gross Alpha | Net alpha | Gross Alpha | Net alpha | Gross Alpha | Net alpha |
| Mar 2020   | 0.56%       | 0.18%     | 0.41%       | 0.05%     | 1.31%       | 0.29%     |
| Feb 2020   | 0.25%       | -0.14%    | 0.24%       | -0.12%    | -0.91%      | -1.93%    |
| Q1 2020    | 0.92%       | -0.23%    | 0.66%       | -0.42%    | 0.30%       | -2.76%    |

Source: J.P. Morgan.

**Table 3: Factor Correlations**

12m long-short factor correlations as of March 2020

| USIG       |       |          |          |            |
|------------|-------|----------|----------|------------|
|            | Value | Momentum | Low Risk | Integrated |
| Value      | 100%  | -46%     | -57%     | -41%       |
| Momentum   |       | 100%     | 31%      | 88%        |
| Low Risk   |       |          | 100%     | 63%        |
| Integrated |       |          |          | 100%       |
| EURIG      |       |          |          |            |
|            | Value | Momentum | Low Risk | Integrated |
| Value      | 100%  | -59%     | -81%     | -52%       |
| Momentum   |       | 100%     | 68%      | 93%        |
| Low Risk   |       |          | 100%     | 75%        |
| Integrated |       |          |          | 100%       |
| USHY       |       |          |          |            |
|            | Value | Momentum | Low Risk | Integrated |
| Value      | 100%  | -44%     | -29%     | -29%       |
| Momentum   |       | 100%     | 86%      | 62%        |
| Low Risk   |       |          | 100%     | 41%        |
| Integrated |       |          |          | 100%       |

Source: J.P. Morgan.

**Table 4: Comparison of gross long-only factor performance with and without liquidity filtering**

'No Lqd Filter' is the entire available cross-section of bonds. 'Lqd filter' is a liquidity filtered cross-section containing top two-third of the most liquid bonds. All returns are credit excess returns defined to be bond total return in excess of duration matched treasuries

| Value      |        |               |              |        |               |              |        |               |              |
|------------|--------|---------------|--------------|--------|---------------|--------------|--------|---------------|--------------|
|            | EURIG  |               |              | USIG   |               |              | USHY   |               |              |
|            | Market | No Lqd Filter | Lqd universe | Market | No Lqd Filter | Lqd universe | Market | No Lqd Filter | Lqd universe |
| Mar 2020   | -6.2%  | -5.7%         | -6.8%        | -12.3% | -13.4%        | -14.3%       | -14.7% | -15.3%        | -12.9%       |
| Feb 2020   | -1.0%  | -0.6%         | -0.9%        | -2.0%  | 0.0%          | -1.7%        | -3.1%  | -3.1%         | -3.7%        |
| Q1 2020    | -7.2%  | -6.0%         | -7.4%        | -14.8% | -14.7%        | -16.1%       | -19.0% | -19.4%        | -18.1%       |
| Momentum   |        |               |              |        |               |              |        |               |              |
|            | EURIG  |               |              | USIG   |               |              | USHY   |               |              |
|            | Market | No Lqd Filter | Lqd universe | Market | No Lqd Filter | Lqd universe | Market | No Lqd Filter | Lqd universe |
| Mar 2020   | -6.2%  | -5.0%         | -6.1%        | -12.3% | -9.6%         | -11.0%       | -14.7% | -17.8%        | -18.2%       |
| Feb 2020   | -1.0%  | -0.9%         | -1.1%        | -2.0%  | -1.5%         | -1.8%        | -3.1%  | -3.6%         | -5.0%        |
| Q1 2020    | -7.2%  | -5.7%         | -6.9%        | -14.8% | -11.7%        | -13.4%       | -19.0% | -22.5%        | -25.0%       |
| Low Risk   |        |               |              |        |               |              |        |               |              |
|            | EURIG  |               |              | USIG   |               |              | USHY   |               |              |
|            | Market | No Lqd Filter | Lqd universe | Market | No Lqd Filter | Lqd universe | Market | No Lqd Filter | Lqd universe |
| Mar 2020   | -6.2%  | -4.4%         | -5.5%        | -12.3% | -10.8%        | -10.5%       | -14.7% | -12.1%        | -13.0%       |
| Feb 2020   | -1.0%  | -0.6%         | -0.8%        | -2.0%  | -1.3%         | -1.3%        | -3.1%  | -2.2%         | -3.0%        |
| Q1 2020    | -7.2%  | -4.8%         | -6.1%        | -14.8% | -12.2%        | -11.9%       | -19.0% | -14.7%        | -16.6%       |
| Integrated |        |               |              |        |               |              |        |               |              |
|            | EURIG  |               |              | USIG   |               |              | USHY   |               |              |
|            | Market | No Lqd Filter | Lqd universe | Market | No Lqd Filter | Lqd universe | Market | No Lqd Filter | Lqd universe |
| Mar 2020   | -6.2%  | -5.2%         | -6.5%        | -12.3% | -11.4%        | -11.9%       | -14.7% | -16.2%        | -17.7%       |
| Feb 2020   | -1.0%  | -1.0%         | -1.4%        | -2.0%  | -1.5%         | -2.1%        | -3.1%  | -4.3%         | -3.8%        |
| Q1 2020    | -7.2%  | -5.9%         | -7.6%        | -14.8% | -13.2%        | -14.9%       | -19.0% | -21.7%        | -23.3%       |

Source: J.P. Morgan.

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