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# ESG Improvers in Credit Investing

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ASSET MANAGEMENT



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# ESG Improvers in Credit Investing

## Abstract

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The objective of this article is to explore the impact of ESG Improvers on the corporate bond market. We study passive and active strategies respectively on a broad portfolio and a concentrated portfolio. In particular, we examine how the ESG Improvers strategy behaves if we constrain the optimised portfolio to match the benchmark risk metrics. Some constraints are then relaxed to build a concentrated portfolio. We analyse three investment universes: euro-denominated investment-grade, dollar-denominated investment-grade, and global high-yield. Results not only show that the ESG Improvers strategy is a driver of performance, but also it tends to create portfolios with higher ESG weighted scores than their related benchmarks.

**Keywords:** ESG investing, passive management, bond picking, active management, momentum, duration, yield spread, credit risk.

**JEL classification:** G10, M14, Q01.

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## About the authors



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## 1 Introduction

“ESG Improvers” is a philosophy that aims to capture additional alpha by employing a forward-looking approach to identify companies with positive momentum in addressing their ESG risks and opportunities. It complements a more traditional ESG approach, which targets “ESG winners” according to their current ESG ranking. Companies with improved ESG performances are expected to exhibit future enhanced operational performance and to deliver enhanced cash flows, which may result in tighter credit spreads and higher share prices. Identifying this improved performance at an early stage before its pricing by the market can be a source of future outperformance (Eccles *et al.*, 2014).

The literature about ESG momentum is still in its infancy and focuses exclusively on stocks. Khan *et al.* (2016) and Kaiser (2020) argue that changes in ESG scores can be predictors of future stock performance. Nagy *et al.* (2016) find that a strategy tilting a market-cap-weighted portfolio toward companies that show a positive ESG rating trend significantly outperformed both the benchmark and a comparable strategy that tilts the portfolio weights toward companies with high ESG ratings. They notice that idiosyncratic risk, which could be related to ESG signals, makes up about half of the cumulative outperformance. Verheyden *et al.* (2016) show that incorporating ESG momentum criteria in screening strategies contributes to higher risk-adjusted returns. Recently, by comparing the historical performance of the top ESG momentum quintile to the bottom ESG quintile, Giese *et al.* (2019) find that an improvement in ESG characteristics leads to increasing valuations over time. They conclude that the ESG momentum can be a valuable financial indicator to be used in addition to the actual ESG rating in index or portfolio construction methodologies.

At first sight, the ESG Improvers is appropriate for active strategies. Indeed, unlike the “ESG winners” approach, where commonly a percentage of “best-in-class” companies is defined within each sector, sectors or companies may improve much than others resulting in a sector or issuer bias. In this article, we study both passive and active strategies in the credit space. We examine how the ESG Improvers strategy behaves if we constrain the optimised portfolio to match the benchmark risk metrics. Some constraints are then relaxed to build actively managed portfolios. This article is structured as follows: Section Two introduces the ESG framework while Section Three and Four present portfolio optimisations’ results in passive and active strategies. Finally, Section Five offers some concluding remarks.

## 2 ESG Framework

We consider the scoring system provided by the Amundi ESG Research department. For each bond issuer and date, we access the **ESG** score and its three components: **E** (environmental), **S** (social), and **G** (governance). These scores are based on the data of four external providers and are reviewed and validated by internal ESG Analysts. The scores are normalized sector by sector to obtain a  $z$ -score shape, implying that they range between  $-3$  and  $+3$ . This also means that the scores are sector-neutral<sup>1</sup> and distributed as a standard Gaussian probability distribution<sup>2</sup>.

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<sup>1</sup>with the Global Industry Classification Standard (GICS) taxonomy.

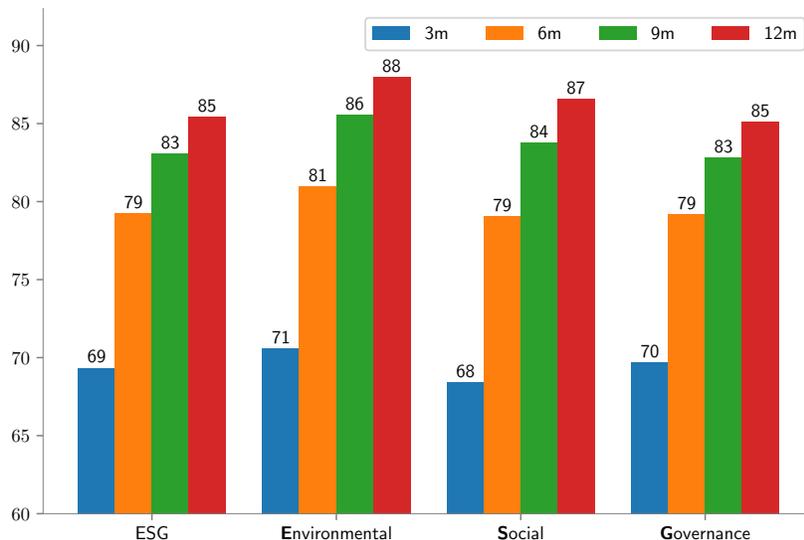
<sup>2</sup>See Appendix A.1 for an empirical distribution of the ESG score.

There is no universally accepted standard for defining momentum. The signal can be a positive dynamic in implementing key ESG policies or a trend of ESG rating upgrades. We choose to define momentum as a  $\mathcal{N}_{Months}$ -month simple moving average<sup>3</sup> in **ESG** score.  $\mathcal{N}_{Months}$  could be 3, 6, 9 or 12. At each rebalancing date  $t$ ,

$$\begin{aligned} Momentum(t) &= \frac{1}{\mathcal{N}_{Months}} \cdot \sum_{i=1}^{\mathcal{N}_{Months}} (z(t) - z(t-i)) \\ &= z(t) - \frac{1}{\mathcal{N}_{Months}} \cdot \sum_{i=1}^{\mathcal{N}_{Months}} z(t-i) \end{aligned}$$

where  $z(t)$  is the **ESG**  $z$ -score at date  $t$ . With this definition, an ESG improver, at date  $t$ , is an issuer whose  $Momentum(t)$  is positive.

Figure 1: Probability to remain improver the next month (in %)



In Figure 1, we report the probability to remain an improver the next month regarding the ESG score and each of its pillars using 3-month, 6-month, 9-month, and 12-month momentums. We note that this probability increases with the number of months considered in the momentum definition. For instance, using 3-month momentum, an issuer has a 69% chance to remain an improver the next month. This probability increases to 85% if we define the momentum using an average of 12 months. If we focus on the three pillars of the ESG, we obtain the same results with a slight advantage for **Environmental** and **Social** over **Governance**. In what follows, we make use of the 12-month momentum.

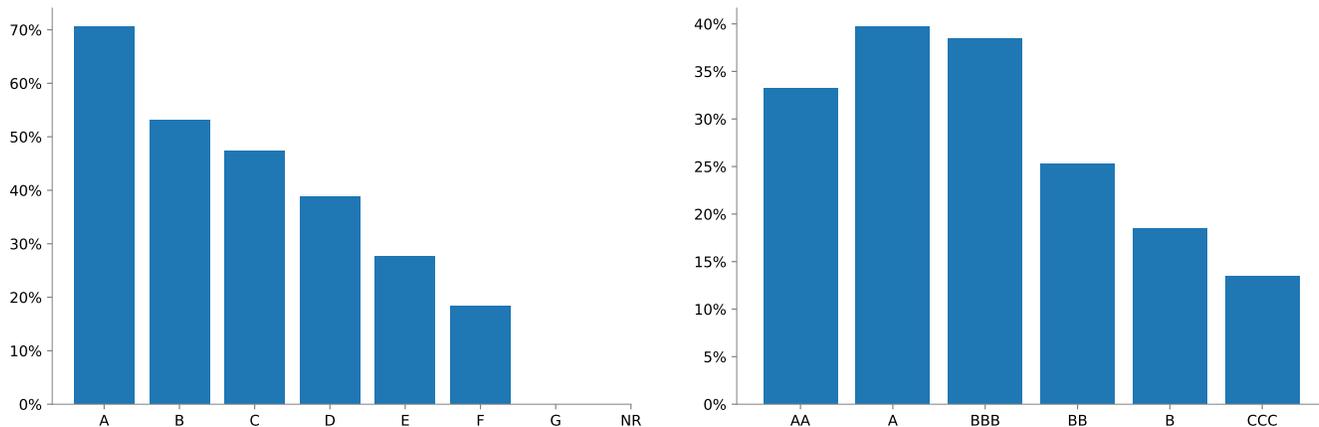
Figure 2 reports the improvers ratio per ESG and credit rating<sup>4</sup>. We define this ratio as the average weight of improvers in a given rating. For instance, on average, 70% of A-rated bonds are

<sup>3</sup>We prefer it to an exponential moving average, that emphasises the recent changes in ESG scores, to avoid likely short-term noises in trends.

<sup>4</sup>We note AA the cluster including both AAA- and AA-rated bonds and CCC the cluster including CCC-, CC- and C-rated bonds.

improvers. We note that the higher the ESG rating, the higher the improver ratio, and we observe that the improver ratio is above 50% for the three first ESG ratings. We point out a positive relationship between credit ratings and improvers ratio but only in the HY space.

Figure 2: ESG Improvers ratio per ESG (left) and credit rating (right)



### 3 Passive management

Many institutional investors implement ESG policy through passive management by discarding the worst-rated bonds from the universe of investment and then applying a capitalization-weighted scheme to form the investment portfolio while controlling for the tracking error risk. In the fixed-income space, the tracking is apprehended by minimizing the differences in modified duration (MD) and duration-times-spread (DTS) between the benchmark and the optimised portfolio. MD is the sensitivity of the bond return to interest risk, and DTS measures the systematic exposure to credit risk by quantifying sensitivity to a shift in the yield spread (Ben Dor *et al.*, 2007).

We consider three investment universes: EUR Investment Grade, USD Investment Grade, and the Global High Yield. To form our ESG improvers optimised portfolios, we discard bonds that do not satisfy at least one of the five following conditions: (1) positive momentum, (2) reasonable spread, (3) benchmark outstanding amount, (4) EUR, GBP, or USD denominated and (5) duration to worst higher than six months. The portfolios are built with DTS and duration neutralities. They bear the same credit risk per sector, and the same interest rate risk as the benchmark, with a maximum of 2% drift tolerance for the duration. No additional constraint on weight is applied at this stage, letting the optimiser form large-scale portfolios<sup>5</sup>.

The data we collect covers the period between January 2014 and March 2021. The rebalancing is carried out at the end of each month. We calculate the credit returns from January 2015<sup>6</sup>. Credit returns refer to the returns over the government-bond returns of similar duration, thus only reflecting the credit component of the corporate bonds, not the interest-rate component.

<sup>5</sup>We report in Tables 13 and 14 on page 26 statistics on the number of bonds and issuers in portfolios and their related benchmarks.

<sup>6</sup>From January 2016 as far as the HY universe is concerned as the ESG coverage is lower especially before 2016.

### 3.1 Risk metrics

Table 1 reports the statistics of the excess<sup>7</sup> DTS, the excess duration, and the excess OAS of the optimised portfolios. We note that all the portfolios are duration neutral since the drift does not exceed 0.07 on average, and are built with a negative DTS, even small, as the maximum excess DTS is at most 0. Contrary to IG portfolios, the HY portfolio is slightly short-DTS ( $-27.28$  on average), due to scarce ESG coverage mainly in the first years. On average, the excess spread is negative. While it is between  $-3$  bps and  $-2$  bps when we consider IG universes, the HY optimised portfolio shows a significantly low carry versus its benchmark ( $-67.11$  bps).

Table 1: Duration, DTS and OAS statistics

|                        | EUR IG | USD IG | Global HY |
|------------------------|--------|--------|-----------|
| <b>Excess-Duration</b> |        |        |           |
| Average                | -0.02  | -0.07  | 0.05      |
| Standard deviation     | 0.07   | 0.08   | 0.05      |
| Median                 | -0.02  | -0.10  | 0.08      |
| Maximum                | 0.10   | 0.13   | 0.08      |
| Minimum                | -0.11  | -0.16  | -0.08     |
| <b>Excess-DTS</b>      |        |        |           |
| Average                | -0.75  | -0.24  | -27.28    |
| Standard deviation     | 1.46   | 0.73   | 35.21     |
| Median                 | -0.24  | 0.00   | 0.00      |
| Maximum                | 0.00   | 0.00   | 0.00      |
| Minimum                | -8.86  | -4.04  | -108.22   |
| <b>Excess-OAS</b>      |        |        |           |
| Average                | -1.95  | -3.12  | -67.11    |
| Standard deviation     | 2.45   | 4.61   | 36.33     |
| Median                 | -1.37  | -2.14  | -53.55    |
| Maximum                | 1.89   | 4.85   | -10.46    |
| Minimum                | -9.85  | -26.48 | -161.05   |

In Table 2, we report the average ESG<sup>8</sup> and credit ratings. We highlight a bias towards high ESG rated bonds as their excess weight is positive. We recall the positive relation between the ESG rating and the improver ratio introduced above. Consequently, the optimised portfolios show on average better ESG weighted scores than their related benchmarks. We also stress the high rate of unrated bonds (34.91% on average) in the HY universe. This rate has continuously decreased from 53.96% in early 2015, reaching 11% in March 2021.

In terms of credit ratings, we observe that the ESG improvers strategy overweights the lowest ratings in the IG universe. For instance, the excess weight for BBB is 3.63% in the EUR universe (respectively 2.30% in the USD universe) while the AA is underweighted by 2.58% (respectively 3.72%). In the HY universe, the story is different: The highest ratings BB and B are equal-weighted or overweighted by 3.49%, while the CCC weight is lowered by 2.81%. The rationale behind this behaviour is that compared to the CCC bucket, BB and B buckets exhibit higher ESG Improvers ratios.

<sup>7</sup>Excess refers to the amount over the benchmark metric.

<sup>8</sup>See Appendix A.2 for the definition of Amundi ESG ratings.

Table 2: ESG (left) and credit (right) ratings average excess-weights (in %)

|    | EUR IG |       | USD IG |       | Global HY |        |     | EUR IG |       | USD IG |       | Global HY |       |
|----|--------|-------|--------|-------|-----------|--------|-----|--------|-------|--------|-------|-----------|-------|
|    | Port   | +/-   | Port   | +/-   | Port      | +/-    |     | Port   | +/-   | Port   | +/-   | Port      | +/-   |
| A  | 4.92   | 2.17  | 0.67   | 0.33  | 0.66      | 0.40   | AA  | 9.61   | -2.58 | 8.13   | -3.72 |           |       |
| B  | 23.10  | 5.57  | 4.79   | 1.67  | 6.45      | 3.31   | A   | 39.80  | -1.05 | 43.28  | 1.42  |           |       |
| C  | 44.21  | 5.89  | 26.95  | 8.33  | 19.27     | 9.86   | BBB | 50.59  | 3.63  | 48.59  | 2.30  |           |       |
| D  | 18.71  | -3.84 | 46.96  | 6.76  | 40.12     | 15.66  | BB  |        |       |        |       | 55.63     | -0.68 |
| E  | 8.48   | -4.29 | 19.51  | -7.09 | 30.32     | 8.51   | B   |        |       |        |       | 37.28     | 3.49  |
| F  | 0.58   | -0.87 | 1.06   | -1.35 | 3.20      | -2.45  | CCC |        |       |        |       | 7.09      | -2.81 |
| G  |        | -0.27 | 0.05   | -0.65 |           | -0.47  |     |        |       |        |       |           |       |
| NR |        | -4.41 |        | -8.00 |           | -34.81 |     |        |       |        |       |           |       |

In Table 3, we report the average excess-weights per sector and duration bucket. On the left of the table, we observe that while Energy and Utility sectors are neutral, the strategy overweights Industrials, the first represented sector, and underweights Financials. In the IG universe, the optimiser prefers the 1-3 years duration bucket and, and at the same time, gives less weight to the 3-7 years buckets. The EUR 7-10 years bucket is overweighted (+1.41%), and the USD equivalent bucket is significantly underweighted (-3.15%). Regarding the HY universe, the optimiser underweights bonds whose durations are between 1 and 5 years and overweights the other buckets.

Table 3: Sector (left) and Duration (right) average excess-weights (in %)

|             | EUR IG |       | USD IG |       | Global HY |       |          | EUR IG |       | USD IG |       | Global HY |       |
|-------------|--------|-------|--------|-------|-----------|-------|----------|--------|-------|--------|-------|-----------|-------|
|             | Port   | +/-   | Port   | +/-   | Port      | +/-   |          | Port   | +/-   | Port   | +/-   | Port      | +/-   |
| Energy      | 6.33   | 0.48  | 11.22  | -0.30 | 12.55     | -0.88 | 0-1 yrs  | 0.48   | -0.05 | 1.17   | 0.55  | 8.68      | 1.83  |
| Financials  | 37.35  | -2.93 | 32.55  | -1.32 | 14.87     | -2.86 | 1-3 yrs  | 26.46  | 1.90  | 25.60  | 2.55  | 29.13     | -1.82 |
| Industrials | 45.38  | 2.08  | 50.81  | 1.45  | 68.70     | 3.39  | 3-5 yrs  | 26.11  | -1.78 | 21.22  | -0.74 | 33.85     | -2.38 |
| Utility     | 10.94  | 0.37  | 5.42   | 0.17  | 3.87      | 0.36  | 5-7 yrs  | 21.72  | -1.12 | 16.29  | -0.03 | 20.57     | 1.85  |
|             |        |       |        |       |           |       | 7-10 yrs | 19.23  | 1.41  | 9.73   | -3.15 | 4.79      | 0.34  |
|             |        |       |        |       |           |       | 10+ yrs  | 5.99   | -0.37 | 26.00  | 0.81  | 2.98      | 0.18  |

## 3.2 Performances

Figure 3 illustrates the cumulated credit returns over the 2015-2021 period<sup>9</sup>. The tracking errors are respectively 0.23%, 0.45%, and 1.78%. We point out that the ESG Improvers strategy generates a small positive alpha in the IG universes and especially the EUR universe. In the meantime, the backtest shows a negative alpha in the HY universe consequence of underperformance<sup>10</sup> in 2017 and 2018 and the inherent short-DTS mentioned earlier.

Table 4 reports in bps the excess returns per credit and ESG ratings. We observe that the positive contribution to the alpha comes mainly from the ESG high ratings and BBB and BB credit

<sup>9</sup>Cumulated total returns are displayed in Figure 9 on page 23.

<sup>10</sup>Cf. Figure 10 on page 24, where we report the calendar differences in excess and total returns.

Figure 3: Cumulative credit returns - 2015-2021

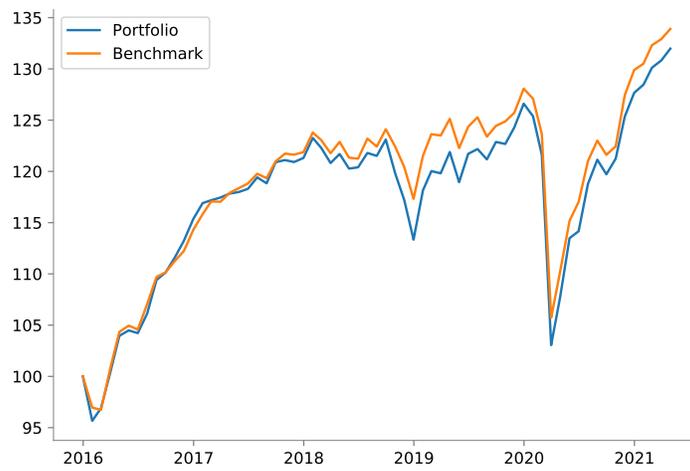
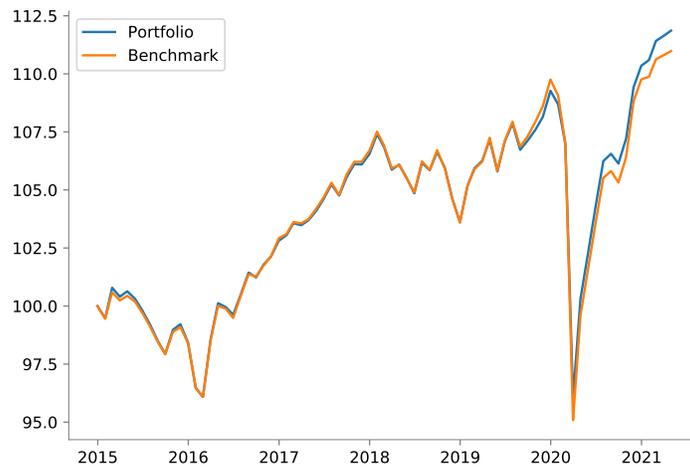
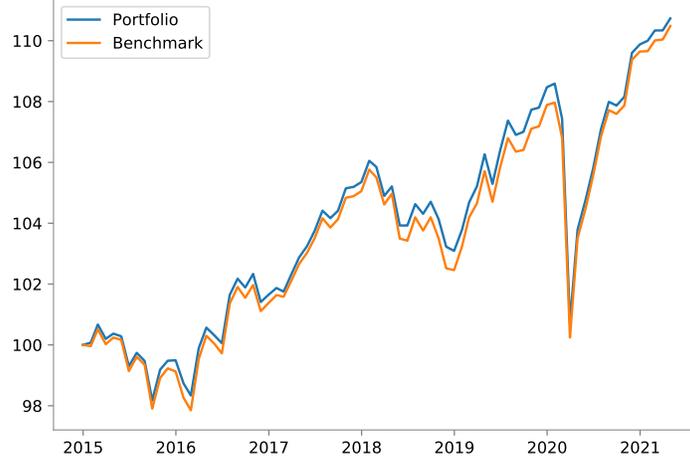


Table 4: ESG (left) and credit (right) ratings excess-returns (in bps)

|    | EUR IG |        | USD IG |        | Global HY |         |     | EUR IG |       | USD IG |       | Global HY |        |
|----|--------|--------|--------|--------|-----------|---------|-----|--------|-------|--------|-------|-----------|--------|
|    | Port   | +/-    | Port   | +/-    | Port      | +/-     |     | Port   | +/-   | Port   | +/-   | Port      | +/-    |
| A  | 7.57   | 3.06   | -0.09  | -1.15  | 4.34      | 2.51    | AA  | 12.32  | 0.82  | 10.10  | -4.26 |           |        |
| B  | 39.32  | 8.08   | 9.94   | 4.65   | 30.54     | 15.32   | A   | 44.43  | -2.29 | 55.34  | -8.29 |           |        |
| C  | 61.60  | 4.74   | 42.63  | 10.07  | 129.79    | 54.85   | BBB | 99.91  | 7.42  | 112.48 | 22.25 |           |        |
| D  | 36.08  | 3.28   | 89.41  | 24.20  | 93.27     | -63.34  | BB  |        |       |        |       | 360.84    | 48.42  |
| E  | 13.25  | -13.47 | 38.18  | -12.13 | 268.35    | 149.76  | B   |        |       |        |       | 176.97    | 2.31   |
| F  | -0.50  | -3.13  | -0.62  | -6.28  | 11.45     | -21.96  | CCC |        |       |        |       | 2.31      | -67.83 |
| G  |        | -0.39  | 0.55   | -1.17  |           | -2.41   |     |        |       |        |       |           |        |
| NR |        | 3.34   |        | -9.27  |           | -155.94 |     |        |       |        |       |           |        |

ratings. The alpha attributed to the BBB rating in the EUR (respectively the USD) portfolio is +7.42 bps (respectively +22.25 bps). BB-rated bonds contribute by +48.42 bps. Regarding ESG ratings, we notice that the three highest ratings contribute positively<sup>11</sup>. D and E ratings exhibit opposite behaviours. The contribution of the former is positive in the IG space and is the worst (-63.34 bps) in the HY universe. At the same time, the E rating shows the worst contribution in the IG universe and the best contribution to the alpha in the HY universe (+149.76 bps). We point out that the absence of unrated bonds adds 3.34 bps to the EUR portfolio's alpha but penalizes those of the USD portfolio (-9.27 bps) and particularly the HY portfolio (-155.94 bps).

Table 5: Average weighted yield (left) and average OAS (right) per ESG rating (in bps)

|    | EUR IG |       | USD IG |        | Global HY |         |    | EUR IG |         | USD IG |         | Global HY |         |
|----|--------|-------|--------|--------|-----------|---------|----|--------|---------|--------|---------|-----------|---------|
|    | Port   | +/-   | Port   | +/-    | Port      | +/-     |    | Port   | +/-     | Port   | +/-     | Port      | +/-     |
| A  | 4.42   | 1.83  | 2.13   | 1.02   | 2.54      | 1.18    | A  | 113.12 | -8.96   | 148.25 | -11.88  | 300.49    | -220.39 |
| B  | 19.26  | 4.71  | 14.67  | 5.20   | 29.68     | 17.99   | B  | 112.86 | -0.66   | 135.99 | -1.60   | 372.14    | 28.45   |
| C  | 36.62  | 6.97  | 81.27  | 26.72  | 93.72     | 50.66   | C  | 111.86 | 3.25    | 122.04 | 4.39    | 397.91    | 18.51   |
| D  | 14.41  | -3.80 | 144.56 | 21.11  | 213.08    | 84.94   | D  | 110.69 | -1.28   | 131.02 | 3.09    | 387.05    | -5.04   |
| E  | 8.92   | -4.76 | 63.44  | -23.37 | 175.20    | 50.01   | E  | 135.04 | -5.53   | 146.54 | 0.52    | 426.95    | -6.90   |
| F  | 0.68   | -0.84 | 3.77   | -4.43  | 16.88     | -16.23  | F  | 127.36 | -4.45   | 153.57 | -9.63   | 350.82    | -115.19 |
| G  |        | -0.26 | 0.17   | -1.90  |           | -3.39   | G  |        | -150.55 | 122.54 | 7.98    |           | -519.49 |
| NR |        | -5.86 |        | -28.55 |           | -253.30 | NR |        | -142.51 |        | -173.59 |           | -584.26 |

The average yield contributions per ESG rating, shown in Table 5, are consistent with those of returns as the excess-yields exhibit almost everywhere<sup>12</sup> the same sign. The average OAS, reported in the same table, appears to have a U-shape relationship with the ESG ratings in the IG universe and especially with USD-denominated rated bonds. The HY space has an inverted relationship. In contrast, the excess-OAS displays an inverted U-shape whose lowest and highest values are more and more pronounced if we move from the EUR portfolio to the HY portfolio passing through the USD portfolio. If we focus on the credit rating, Table 6 indicates, in addition to the expected decreasing relationship between the credit rating and the OAS, that on average,

<sup>11</sup>If we exclude the small underperformance of A in the USD portfolio.

<sup>12</sup>Only two exceptions are related to the D rating.

Table 6: Average weighted yield (left) and average OAS (right) per credit rating (in bps)

|     | EUR IG |       | USD IG |        | Global HY |        |     | EUR IG |       | USD IG |        | Global HY |         |
|-----|--------|-------|--------|--------|-----------|--------|-----|--------|-------|--------|--------|-----------|---------|
|     | Port   | +/-   | Port   | +/-    | Port      | +/-    |     | Port   | +/-   | Port   | +/-    | Port      | +/-     |
| AA  | 3.35   | -1.69 | 18.83  | -11.29 |           |        | AA  | 68.45  | -0.83 | 65.13  | -10.24 |           |         |
| A   | 25.96  | -1.35 | 119.21 | 1.77   |           |        | A   | 94.95  | -1.95 | 99.98  | -5.44  |           |         |
| BBB | 55.01  | 1.09  | 171.97 | 5.32   |           |        | BBB | 138.52 | -7.38 | 172.33 | -6.03  |           |         |
| BB  |        |       |        |        | 246.42    | -1.15  | BB  |        |       |        |        | 321.25    | 3.29    |
| B   |        |       |        |        | 230.82    | 7.01   | B   |        |       |        |        | 482.25    | -39.43  |
| CCC |        |       |        |        | 53.82     | -74.02 | CCC |        |       |        |        | 660.32    | -490.23 |

the portfolio's OAS is below the benchmark's OAS for each category of credit rating<sup>13</sup>.

In respect of sectors, as depicted in Table 7, the main positive contribution comes from the Energy sector in the IG universe. Financials and Industrials have different behaviour in EUR and USD universes. While financials contribute negatively in the EUR universe ( $-3.12$  bps) and positively in the USD universe ( $+5.86$  bps), Industrials have positive alpha in the EUR universe ( $+3.59$  bps) and negative alpha in the USD universe ( $-6.13$  bps). In the HY universe, Industrials are the best performers, then comes the Utility sector. Energy with  $-111.60$  bps of performance is the only sector that exhibits significant underperformance<sup>14</sup>.

Table 7: Sector (left) and Duration (right) average excess-returns (in bps)

|             | EUR IG |       | USD IG |       | Global HY |         |          | EUR IG |       | USD IG |       | Global HY |        |
|-------------|--------|-------|--------|-------|-----------|---------|----------|--------|-------|--------|-------|-----------|--------|
|             | Port   | +/-   | Port   | +/-   | Port      | +/-     |          | Port   | +/-   | Port   | +/-   | Port      | +/-    |
| Energy      | 13.08  | 4.21  | 18.03  | 10.38 | -2.96     | -111.60 | 0-1 yrs  | 0.45   | 0.51  | -0.67  | -0.39 | 54.92     | 26.21  |
| Financials  | 66.67  | -3.12 | 66.61  | 5.86  | 83.78     | 0.05    | 1-3 yrs  | 29.23  | 3.52  | 27.20  | 3.93  | 67.58     | -90.57 |
| Industrials | 60.71  | 3.59  | 87.08  | -6.13 | 431.20    | 87.30   | 3-5 yrs  | 38.60  | -5.42 | 29.87  | -2.35 | 241.31    | 39.03  |
| Utility     | 16.53  | 1.19  | 8.27   | -0.81 | 32.16     | 11.74   | 5-7 yrs  | 36.47  | -1.00 | 30.74  | 4.56  | 92.18     | 4.10   |
|             |        |       |        |       |           |         | 7-10 yrs | 42.49  | 10.28 | 13.46  | -9.70 | 14.18     | -16.59 |
|             |        |       |        |       |           |         | 10+ yrs  | 10.57  | -2.07 | 79.86  | 13.09 | 70.99     | 20.11  |

About duration buckets, Table 7 shows that in the IG universe, the overweighted or equal-weighted (respectively the underweighted) buckets contribute positively (respectively negatively) to the alpha. The 7-10 years bucket offers the highest contribution in the EUR universe ( $+10.28$  bps), while the 5-7 years bucket is the main contributor in the USD universe ( $+4.56$  bps). In the HY universe, the positive contribution comes from the very short bonds or bonds belonging to the 3-5 years bucket.

## 4 Active management

Following the optimisation process described above, we incorporate, in this section, a new restriction on the minimum weight per instrument. The result of this construction approach is a

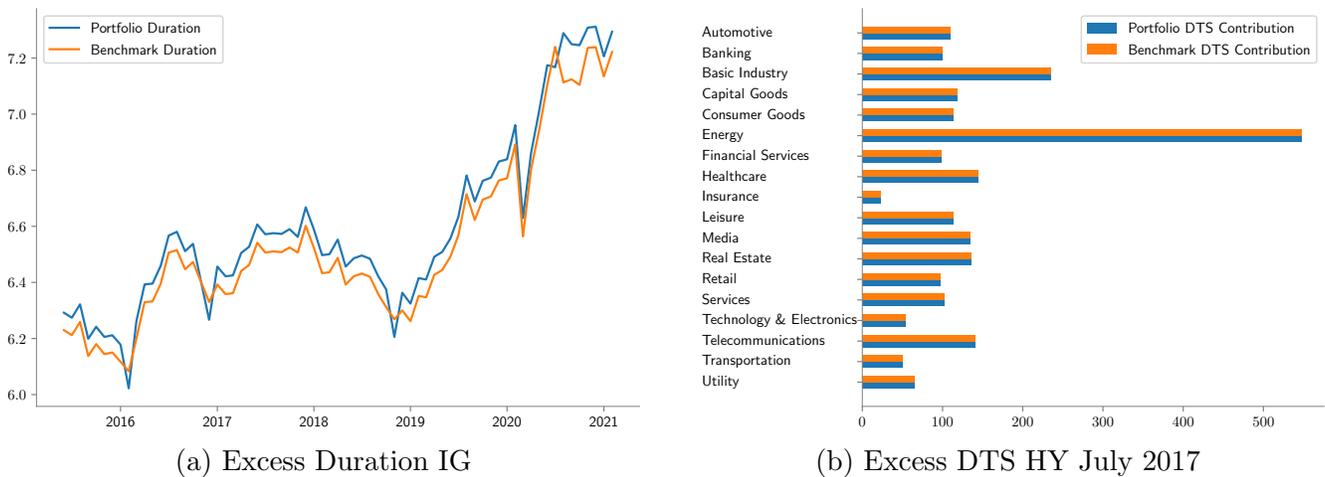
<sup>13</sup>One exception is related to the BB rating.

<sup>14</sup>In Table 15 on page 27, we show that the energy underperformance is due to subsectors Energy exploration & production ( $-81.70$  bps), Oil field equipment & services ( $-42.05$  bps), and Integrated energy ( $-34.72$  bps). Gas distribution offsets partially the underperformance by  $+48.63$  bps.

portfolio with neutral sector bias, minimal excess duration, and a manageable bonds' number, intended to serve as a proxy for an actively managed portfolio.

We consider the Global Corporate Index and the Global High Yield Index as the IG and HY universes. The difference, at this stage, is that we are no longer analysing each currency individually; instead, we let the portfolio construction process decide which instrument is the optimal one to match the restrictions. The rebalancing process occurs at the end of each month from June 2015 until March 2021. On each rebalancing date, we built a new portfolio by minimising the excess DTS per sector, letting the overall portfolio duration drift between  $-2\%$  and  $2\%$ , and limiting the weight of each bond, if selected, to  $1.5\%$ . Moreover, we choose, when it is possible<sup>15</sup>, the bonds with a DTS close to their related issuer average DTS.

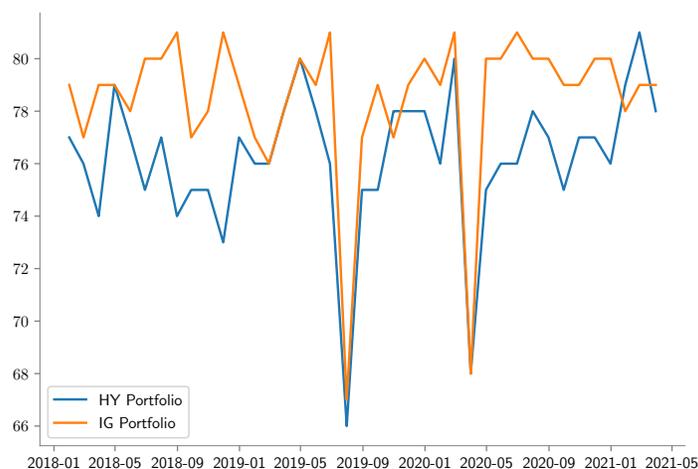
Figure 4: Excess Duration and DTS



As expected, Figure 4 shows the duration drift is within the tolerance range for both IG and HY. Likewise, the excess DTS is closer to zero. The optimisation results deliver a portfolio with nearly 70 bonds on average. Figure 5 shows the number of holdings for the portfolios during the last three years.

<sup>15</sup>At least five bonds represent the issuer in the universe.

Figure 5: Number of bonds held in IG and HY Portfolios



As in the passive management approach, the new restrictions do not change the bias of the portfolio towards higher ESG rated bonds. As we see in Table 8, the portfolio, in IG and HY, still keeps the overweight on higher ESG scores.

Table 8: Average weight per ESG Score over 5 years

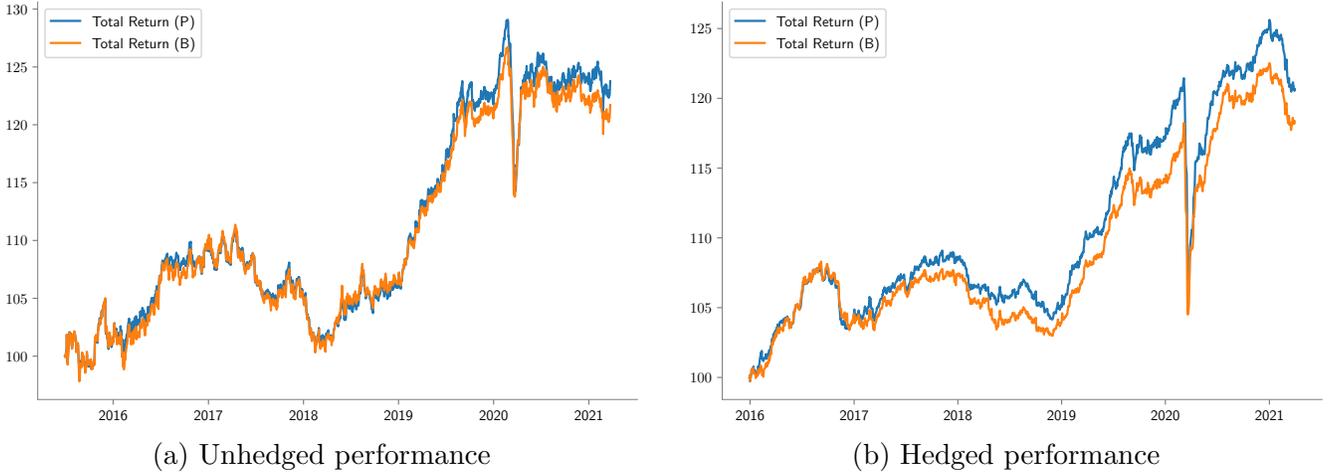
| Weight (%)     | Investment Grade |           |        | High Yield |           |        |
|----------------|------------------|-----------|--------|------------|-----------|--------|
|                | Portfolio        | Benchmark | +/-    | Portfolio  | Benchmark | +/-    |
| ESG Rating     |                  |           |        |            |           |        |
| A              | 0.77             | 0.16      | 0.61   | 0.70       | 0.10      | 0.60   |
| B+ to C+       | 27.67            | 11.31     | 16.36  | 16.70      | 5.98      | 10.72  |
| C to D         | 63.68            | 40.49     | 23.19  | 65.57      | 30.67     | 34.90  |
| D- to F-       | 7.88             | 8.07      | -0.19  | 17.03      | 10.76     | 6.27   |
| G              | 0.00             | 0.51      | -0.51  | 0.00       | 0.48      | -0.48  |
| Not Classified | 0.00             | 39.46     | -39.46 | 0.00       | 52.01     | -52.01 |

#### 4.1 Investment grade results for hedged and unhedged portfolios

In terms of performance, we compile the results for the same portfolio in two different ways, one version with unhedged currency risk in EUR and another one with a 1-Month rolling FX hedge to EUR. The total return over the last five years for the former is 23.7% (versus 21.7% Benchmark) and for the latter 20.6% (versus 18.3% Benchmark), which in annualized figures, would be 4.36% (versus 4.01% Benchmark) and 3.82% (versus 3.43% Benchmark) consequently.

The tracking error for the unhedged portfolio (1Y) is 1.51, with an information ratio of 1.20, whereas the tracking error for the hedged portfolio (1Y) is 1.53, with an information ratio of 0.58. The main difference between the unhedged and the hedged portfolios arises from the EUR depreciation from 2017 until 2020, when the hedged portfolio outperforms the benchmark. This difference gets reduced when the EUR re-appreciates in early 2020. Notwithstanding, to understand where

Figure 6: Unhedged/Hedged IG performances in EUR



the main differences are generated, we focus on the performance analysis of the unhedged version of the portfolio. Figure 11 displays in green (respectively in red) the positive (respectively the negative) monthly returns. Most excess returns lay in the  $[-50 \text{ bps}, +50 \text{ bps}]$  range. Over the whole study period, the hit ratio, which measures the frequency of positive returns, is 57.97%. The average and the median excess returns are 2.85 and 6.17 bps, meaning that the mass of the returns distribution is on the right of the mean. If we focus on calendar returns (see Table 16), only 2016 exhibits a hit-ratio below 50%. While 2019 is the year where the mean return is the highest, the two recent years show the highest median returns.

To understand the outperformance since December 2019 (where a significant portion of alpha was achieved, 1.11%), we use a total return performance attribution<sup>16</sup> by rating, currency, and yield factors. Accordingly, when aggregating the portfolio by composite ratings, we see in Table 9 that the portfolio ends up concentrating on A-rated names, where BBBs are the best performers.

Table 9: IG Performance Attribution by Bloomberg Composite Rating

| Composite Rating | Average Weight (%) |               |             | Total return (%) |             |             | Contribution to return (%) |             |             | Effects (%)  |             |             | Total attribution (%) |
|------------------|--------------------|---------------|-------------|------------------|-------------|-------------|----------------------------|-------------|-------------|--------------|-------------|-------------|-----------------------|
|                  | Port               | Bench         | +/-         | Port             | Bench       | +/-         | Port                       | Bench       | +/-         | Allocation   | Selection   | Currency    |                       |
| <b>Total</b>     | <b>100.00</b>      | <b>100.00</b> | <b>0.00</b> | <b>1.91</b>      | <b>0.79</b> | <b>1.11</b> | <b>1.91</b>                | <b>0.79</b> | <b>1.11</b> | <b>-0.28</b> | <b>0.95</b> | <b>0.37</b> | <b>1.11</b>           |
| AAA              | 0.64               | 1.24          | -0.61       | 22.98            | -0.51       | 23.50       | -0.05                      | 0.00        | -0.05       | 0.12         | -0.02       | 0.01        | 0.12                  |
| AA               | 17.16              | 10.16         | 6.99        | 2.41             | 0.09        | 2.32        | 0.93                       | 0.03        | 0.89        | -0.23        | 0.16        | -0.16       | -0.21                 |
| A                | 43.22              | 42.33         | 0.89        | 0.79             | 0.58        | 0.21        | -0.06                      | 0.23        | -0.29       | 0.13         | -0.10       | 0.37        | 0.41                  |
| BBB              | 36.00              | 45.06         | -9.06       | 4.05             | 1.86        | 2.19        | 1.94                       | 0.80        | 1.14        | 0.03         | 1.05        | 0.21        | 1.32                  |
| BB               | 2.99               | 1.03          | 1.96        | 2.77             | -8.38       | 11.14       | -0.84                      | -0.24       | -0.60       | -0.35        | -0.14       | -0.09       | -0.56                 |

In terms of currencies, Table 10 shows that the selection on USD and GBP were positive elements of performance, mainly due to lower-yielding names selection.

<sup>16</sup>The performance attribution analysis on the hedged portfolio is available in Appendix in Table 18.

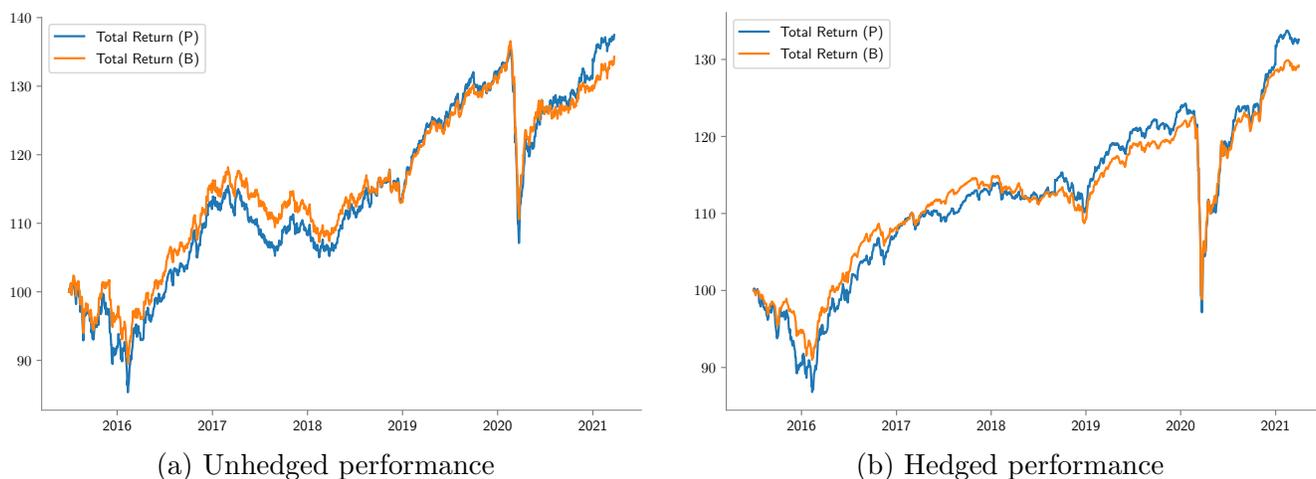
Table 10: IG Performance Attribution by FX and Yield

| Currency               | Average Weight (%) |               |              | Total return (%) |              |              | Contribution to return (%) |              |              | Effects (%)  |             |             | Total attribution (%) |
|------------------------|--------------------|---------------|--------------|------------------|--------------|--------------|----------------------------|--------------|--------------|--------------|-------------|-------------|-----------------------|
|                        | Yield to Worst     | Port          | Bench        | +/-              | Port         | Bench        | +/-                        | Port         | Bench        | +/-          | Allocation  | Selection   |                       |
| <b>Total</b>           | <b>100.00</b>      | <b>100.00</b> | <b>0.00</b>  | <b>1.91</b>      | <b>0.79</b>  | <b>1.11</b>  | <b>1.91</b>                | <b>0.79</b>  | <b>1.11</b>  | <b>-0.66</b> | <b>1.33</b> | <b>0.37</b> | <b>1.11</b>           |
| <b>US Dollar</b>       | <b>73.24</b>       | <b>65.89</b>  | <b>7.35</b>  | <b>1.24</b>      | <b>0.19</b>  | <b>1.05</b>  | <b>1.54</b>                | <b>0.17</b>  | <b>1.36</b>  | <b>-0.13</b> | <b>0.92</b> | <b>0.06</b> | <b>0.90</b>           |
| < 1                    | 17.28              | 10.81         | 6.47         | -0.82            | 8.41         | -9.23        | -1.54                      | -0.59        | -0.95        | -0.47        | 0.16        | -1.57       | -1.85                 |
| 1 - 2                  | 23.21              | 16.63         | 6.59         | 5.93             | 9.61         | -3.68        | 1.52                       | -0.07        | 1.59         | 1.34         | -0.32       | 0.87        | 2.09                  |
| 2 - 3                  | 11.65              | 20.20         | -8.55        | 8.50             | 11.60        | -3.10        | 2.09                       | 2.57         | -0.48        | -0.19        | -1.04       | 2.34        | 0.97                  |
| 3+                     | 21.10              | 18.25         | 2.85         | 1.91             | -8.61        | 10.52        | -0.53                      | -1.73        | 1.21         | 0.28         | 1.16        | -1.58       | -0.17                 |
| <b>Euro</b>            | <b>24.86</b>       | <b>24.55</b>  | <b>0.31</b>  | <b>2.74</b>      | <b>1.91</b>  | <b>0.83</b>  | <b>0.01</b>                | <b>0.42</b>  | <b>-0.42</b> | <b>-0.55</b> | <b>0.28</b> | <b>0.00</b> | <b>-0.27</b>          |
| < 1                    | 20.14              | 18.76         | 1.38         | 2.60             | 3.00         | -0.40        | 0.07                       | 0.53         | -0.46        | 0.13         | -0.27       | 0.00        | -0.13                 |
| 1 - 2                  | 2.94               | 4.24          | -1.30        | 10.17            | 4.07         | 6.11         | -0.30                      | 0.08         | -0.38        | 0.16         | -0.06       | 0.00        | 0.10                  |
| 2 - 3                  | 1.26               | 1.15          | 0.11         | 7.34             | 3.85         | 3.49         | 0.13                       | -0.07        | 0.20         | 0.20         | -0.03       | 0.00        | 0.16                  |
| 3+                     | 0.49               | 0.39          | 0.10         | -1.28            | -15.33       | 14.06        | 0.09                       | -0.11        | 0.20         | 0.12         | 0.02        | 0.00        | 0.13                  |
| <b>British Pound</b>   | <b>1.90</b>        | <b>4.42</b>   | <b>-2.52</b> | <b>39.54</b>     | <b>3.62</b>  | <b>35.92</b> | <b>0.36</b>                | <b>0.16</b>  | <b>0.21</b>  | <b>0.02</b>  | <b>0.13</b> | <b>0.17</b> | <b>0.34</b>           |
| < 1                    | 0.10               | 0.69          | -0.59        | -0.55            | 3.60         | -4.14        | -0.01                      | 0.07         | -0.08        | -0.01        | 0.01        | -0.08       | -0.07                 |
| 1 - 2                  | 0.93               | 2.00          | -1.07        | 25.49            | 8.01         | 17.48        | 0.35                       | 0.08         | 0.26         | 0.01         | 0.10        | 0.17        | 0.29                  |
| 2 - 3                  | 0.20               | 1.21          | -1.00        | 10.69            | 6.49         | 4.20         | 0.06                       | 0.05         | 0.01         | 0.02         | 0.04        | 0.00        | 0.07                  |
| 3+                     | 0.66               | 0.50          | 0.15         | -1.89            | 3.98         | -5.87        | -0.04                      | -0.05        | 0.01         | 0.01         | -0.05       | 0.08        | 0.04                  |
| <b>Canadian Dollar</b> | <b>0.00</b>        | <b>2.96</b>   | <b>-2.96</b> |                  | <b>2.95</b>  | <b>-2.95</b> |                            | <b>0.08</b>  | <b>-0.08</b> | <b>-0.01</b> | <b>0.00</b> | <b>0.06</b> | <b>0.04</b>           |
| <b>Japanese Yen</b>    | <b>0.00</b>        | <b>1.16</b>   | <b>-1.16</b> |                  | <b>-5.74</b> | <b>5.74</b>  |                            | <b>-0.07</b> | <b>0.07</b>  | <b>0.04</b>  | <b>0.00</b> | <b>0.07</b> | <b>0.11</b>           |

## 4.2 High Yield results for hedged and unhedged portfolios

In line with the previous section, we compile the results for the same HY portfolio in two different ways, the first one an unhedged currency risk in EUR and the second one with a 1M rolling FX hedge to EUR. The total return over the last five years for the former is 37.4% (versus 34.3% Benchmark) and for the latter 32.4% (vs 29.1% Benchmark). The equivalent annualised returns are 6.57% (versus 6.08% Benchmark) and 5.78% (versus 5.23% Benchmark) for the unhedged and the hedged portfolios.

Figure 7: Unhedged/Hedged HY performances in EUR



In terms of tracking error, the unhedged portfolio (1Y) has a TE of 3.50, with an information ratio of 0.66. In the hedged portfolio, these metrics are 3.56 and 0.61. For attribution purposes, we focus on the unhedged version of the portfolio; we leave the decision of hedging to the manager. Figure 12 shows that most excess returns lay in the  $[-100 \text{ bps}, +100 \text{ bps}]$  range. Over the whole

study period, the hit ratio is 44.93%. The average and the median excess returns are 4.05 and  $-14.17$  bps. Unlike the IG unhedged portfolio, the mass of the returns distribution is on the left of the mean. This unfavorable result on the Global HY is attributed to the relatively low ESG coverage rate, which is under one in two over the period. ESG-rated securities have more robust credit and therefore carry potentially less performance over a bullish credit cycle. If we focus on calendar returns (see Table 17), we note that excluding 2015 (where the hit ratio is 0%) and 2017, the average excess return is positive. In the two recent years, we note that, unlike the IG unhedged, the median is negative (the hit-ratio is only one-third) and is at its lower levels.

Some of the factors that explain the alpha generation of 1.58% since December 2019 are in Tables 11 and 12 and where we analyse the performance attribution by rating, currency, and yield factors<sup>17</sup>

Table 11: HY Performance Attribution by Bloomberg Composite Rating

| Composite Rating | Average Weight (%) |               |             | Total return (%) |             |             | Contribution to return (%) |             |             | Effects (%) |              |             | Total attribution (%) |
|------------------|--------------------|---------------|-------------|------------------|-------------|-------------|----------------------------|-------------|-------------|-------------|--------------|-------------|-----------------------|
|                  | Port               | Bench         | +/-         | Port             | Bench       | +/-         | Port                       | Bench       | +/-         | Allocation  | Selection    | Currency    |                       |
| <b>Total</b>     | <b>100.00</b>      | <b>100.00</b> | <b>0.00</b> | <b>4.68</b>      | <b>3.09</b> | <b>1.58</b> | <b>4.68</b>                | <b>3.09</b> | <b>1.58</b> | <b>0.81</b> | <b>-0.04</b> | <b>0.48</b> | <b>1.58</b>           |
| BBB              | 9.98               | 4.15          | 5.83        | -5.43            | 14.77       | -20.20      | 0.47                       | 0.72        | -0.25       | 0.30        | -1.53        | -0.46       | -1.69                 |
| BB               | 68.12              | 57.42         | 10.70       | 0.91             | 3.78        | -2.87       | 0.19                       | 2.36        | -2.17       | 0.15        | -2.56        | -0.07       | -2.38                 |
| B                | 19.15              | 32.23         | -13.07      | 40.71            | 2.25        | 38.46       | 4.83                       | 0.26        | 4.56        | -0.02       | 5.55         | 0.89        | 6.39                  |
| CCC              | 2.75               | 5.80          | -3.05       | -76.00           | 0.53        | -76.53      | -0.81                      | -0.15       | -0.66       | 0.30        | -1.51        | 0.08        | -0.85                 |
| CC               | 0.00               | 0.08          | -0.08       |                  | -1.27       | 1.27        |                            | -0.02       | 0.02        | 0.02        | 0.00         | 0.00        | 0.02                  |
| C                | 0.00               | 0.05          | -0.05       |                  | 22.23       | -22.23      |                            | -0.02       | 0.02        | 0.02        | 0.00         | 0.00        | 0.02                  |
| Not Classified   | 0.00               | 0.28          | -0.28       |                  | -7.17       | 7.17        |                            | -0.06       | 0.06        | 0.04        | 0.00         | 0.04        | 0.07                  |

From the currencies point of view, we observe how the exposure to USD and EUR denominated names was a driver of performance, mainly due to the selection of the higher-yielding names. In terms of yields, we can see how the portfolio concentrates more on higher-yielding issuers that contribute to performance. As far as EUR denominated bonds are concerned, the portfolio is evenly distributed, with a small bias towards yields below 2%. When comparing ratings, the process also favours the higher-rated names compared to the benchmark, but in this case, the B-rated bonds are those that bring most of the performance.

<sup>17</sup>The performance attribution analysis on the hedged portfolio is available in Appendix in Table 19.

Table 12: HY Performance Attribution by FX and Yield

| Currency             | Average Weight (%) |               |               | Total return (%) |             |               | Contribution to return (%) |             |              | Effects (%)  |              |              | Total attribution (%) |
|----------------------|--------------------|---------------|---------------|------------------|-------------|---------------|----------------------------|-------------|--------------|--------------|--------------|--------------|-----------------------|
|                      | Yield to Worst     | Port          | Bench         | +/-              | Port        | Bench         | +/-                        | Port        | Bench        | +/-          | Allocation   | Selection    |                       |
| <b>Total</b>         | <b>100.00</b>      | <b>100.00</b> | <b>0.00</b>   | <b>4.68</b>      | <b>3.09</b> | <b>1.58</b>   | <b>4.68</b>                | <b>3.09</b> | <b>1.58</b>  | <b>-0.61</b> | <b>1.38</b>  | <b>0.48</b>  | <b>1.58</b>           |
| <b>US Dollar</b>     | <b>64.76</b>       | <b>79.86</b>  | <b>-15.10</b> | <b>3.73</b>      | <b>2.72</b> | <b>1.01</b>   | <b>1.91</b>                | <b>2.05</b> | <b>-0.14</b> | <b>-0.10</b> | <b>-0.03</b> | <b>0.55</b>  | <b>0.65</b>           |
| < 1                  | 0.72               | 1.26          | -0.54         | -0.32            | 4.69        | -5.02         | 0.39                       | 0.03        | 0.36         | -0.18        | 0.15         | -0.12        | 0.20                  |
| 1 - 2                | 4.17               | 1.82          | 2.35          | 17.43            | 54.42       | -37.00        | 0.71                       | 0.44        | 0.27         | 0.09         | -0.15        | -0.06        | -0.11                 |
| 2 - 3                | 14.81              | 8.00          | 6.82          | 15.48            | 36.75       | -21.26        | 1.90                       | 1.31        | 0.60         | -0.16        | -0.95        | -0.11        | -1.22                 |
| 3+                   | 44.99              | 68.78         | -23.79        | 9.82             | 2.59        | 7.23          | -1.50                      | 0.28        | -1.78        | -0.10        | 0.90         | 0.85         | 1.50                  |
| Others               | 0.07               | 0.00          | 0.07          | 76.90            | 0.00        | 76.90         | 0.41                       | 0.00        | 0.41         | 0.38         | 0.00         | -0.01        | 0.38                  |
| <b>Euro</b>          | <b>34.74</b>       | <b>17.77</b>  | <b>16.97</b>  | <b>9.45</b>      | <b>4.35</b> | <b>5.11</b>   | <b>2.97</b>                | <b>0.90</b> | <b>2.07</b>  | <b>-0.49</b> | <b>1.41</b>  | <b>0.00</b>  | <b>1.03</b>           |
| < 1                  | 8.19               | 1.25          | 6.94          | 6.55             | 12.82       | -6.26         | 0.38                       | 0.05        | 0.33         | -0.31        | -0.10        | 0.00         | -0.33                 |
| 1 - 2                | 10.31              | 3.48          | 6.83          | 4.51             | 6.65        | -2.15         | 0.49                       | 0.23        | 0.26         | 0.23         | -0.24        | 0.00         | -0.01                 |
| 2 - 3                | 8.28               | 4.46          | 3.82          | 7.37             | 4.22        | 3.15          | 0.20                       | 0.36        | -0.16        | 0.21         | -0.38        | 0.00         | -0.14                 |
| 3+                   | 7.97               | 8.59          | -0.62         | 33.97            | 5.86        | 28.12         | 1.89                       | 0.26        | 1.63         | 0.02         | 1.99         | 0.00         | 2.01                  |
| <b>British Pound</b> | <b>0.50</b>        | <b>1.98</b>   | <b>-1.48</b>  | <b>-12.13</b>    | <b>5.65</b> | <b>-17.78</b> | <b>-0.20</b>               | <b>0.10</b> | <b>-0.30</b> | <b>-0.01</b> | <b>-0.01</b> | <b>-0.07</b> | <b>-0.09</b>          |
| < 1                  | 0.00               | 0.02          | -0.02         |                  | -37.42      | 37.42         | 0.00                       | 0.00        | 0.00         | 0.00         | 0.00         | 0.00         | 0.00                  |
| 1 - 2                | 0.00               | 0.08          | -0.08         |                  | 6.22        | -6.22         | 0.01                       | 0.01        | -0.01        | 0.00         | 0.00         | -0.01        | -0.01                 |
| 2 - 3                | 0.00               | 0.30          | -0.30         |                  | 7.02        | -7.02         | 0.03                       | 0.03        | -0.03        | -0.01        | 0.00         | -0.01        | -0.02                 |
| 3+                   | 0.50               | 1.57          | -1.07         | -12.13           | 5.43        | -17.56        | -0.20                      | 0.06        | -0.26        | 0.00         | 0.02         | -0.06        | -0.05                 |

## 5 Conclusion

When applying the ESG improvers approach, or the process of selecting positive changes on ESG ratings, to a large-scale portfolio or a limited size portfolio, we find that the 12-Month ESG momentum is a driver of performance. Passively implemented, the strategy favours issuers from the industrial sector, bonds with BBB/BB credit ratings, and higher ESG ratings. When we impose restrictions on the numbers of bonds, the IG strategy tends to select higher quality names, bonds with a higher credit rating and a lower yield, which contributed to the performance from 2019 until March 2021, the heaviest period over the last five years, in terms of volatility. The HY strategy focuses more on higher-yielding names and B-rated bonds that contribute higher carry to the portfolio.

This back-testing shows that choosing issuers with positive ESG momentum delivers an alpha, even if this strategy is not necessarily excess-return seeking. The aim is to achieve better-suited portfolios, portfolios with higher ESG ratings, and better exposure to growing areas that are not costly for the investor today and will bring more dividends tomorrow.

The optimisation process does not impose restrictions on the portfolio's turnover. This figure ends up as a byproduct of the process influenced by the rebalancing frequency and the tolerances defined in the optimisation process. As a control measure, we suggest decreasing the rebalancing frequency and including a new restriction in the optimisation to prioritize names that exist in the portfolio.

## References

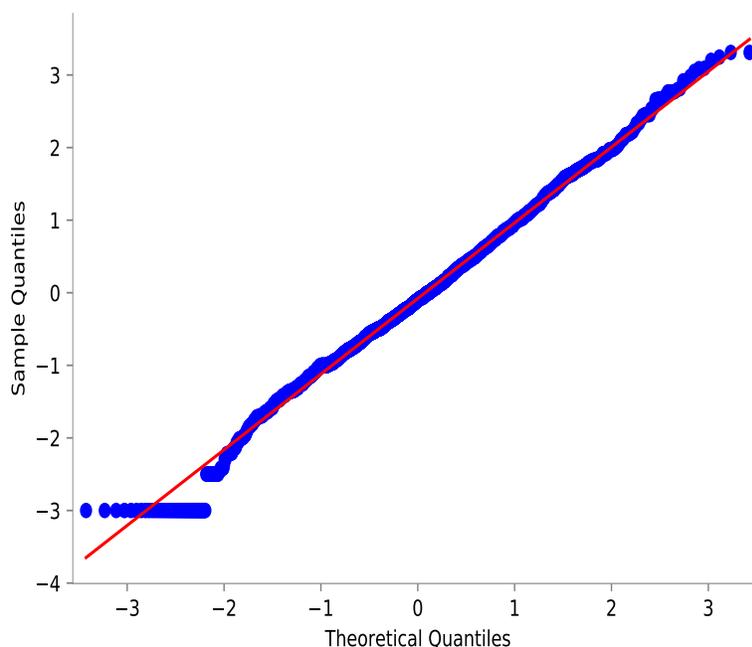
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## A Appendix

### A.1 Amundi ESG scores

Figure 8 shows the q-q plot of the quantiles of the ESG scores dataset against the gaussian distribution quantiles at the end of December 2020. The Gaussian approximation is sound as the q-q plot points lie on the line  $y = x$ .

Figure 8: Q-Q plot of the ESG score (December 2020)



### A.2 Amundi ESG ratings

We define the ESG rating as a letter grade by mapping the  $z$ -score as shown below. This procedure is also performed on each pillar of the **ESG** score.

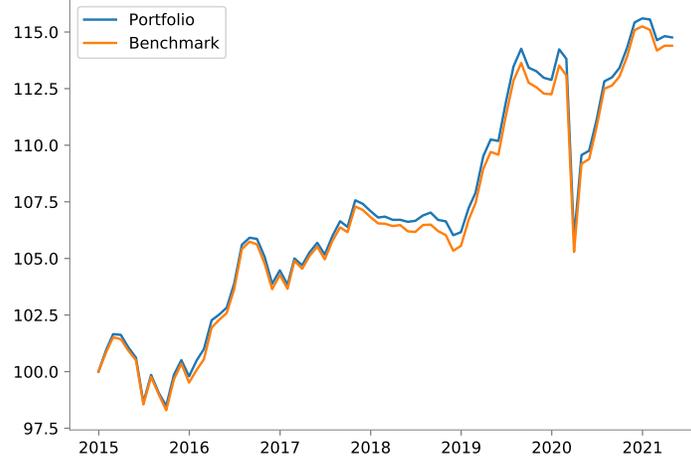
| Rating | $z$ -score                        |
|--------|-----------------------------------|
| A      | $+2.5 \leq z\text{-score}$        |
| B      | $+1.5 \leq z\text{-score} < +2.5$ |
| C      | $+0.5 \leq z\text{-score} < +1.5$ |
| D      | $-0.5 \leq z\text{-score} < +0.5$ |

| Rating | $z$ -score                        |
|--------|-----------------------------------|
| E      | $-1.5 \leq z\text{-score} < -0.5$ |
| F      | $-2.5 \leq z\text{-score} < -1.5$ |
| G      | $z\text{-score} < -2.5$           |

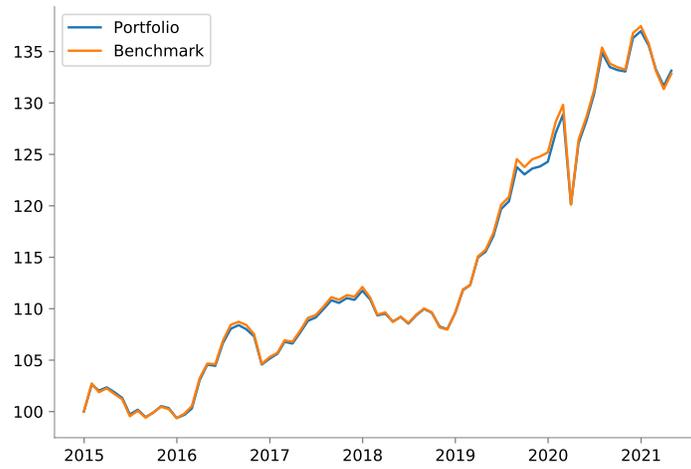
### A.3 Figures

#### A.3.1 Passive management

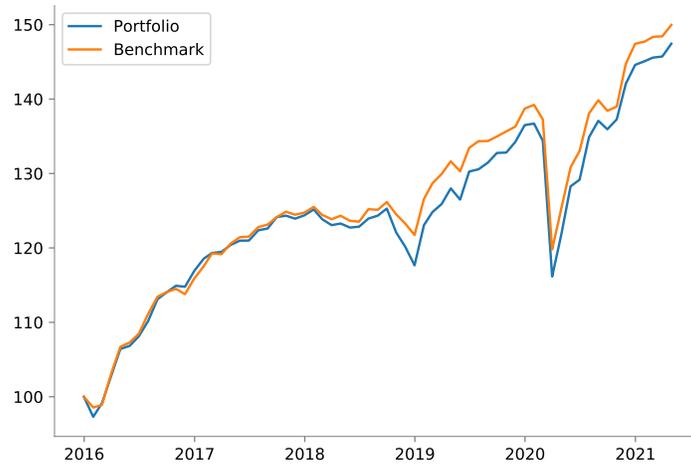
Figure 9: Cumulative total returns - 2015-2021



(a) EUR IG

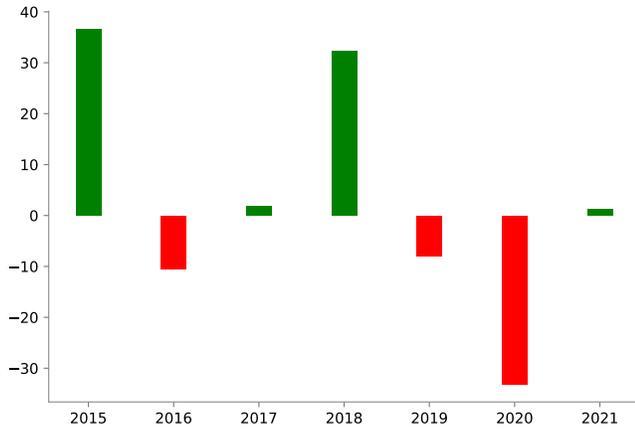


(b) USD IG

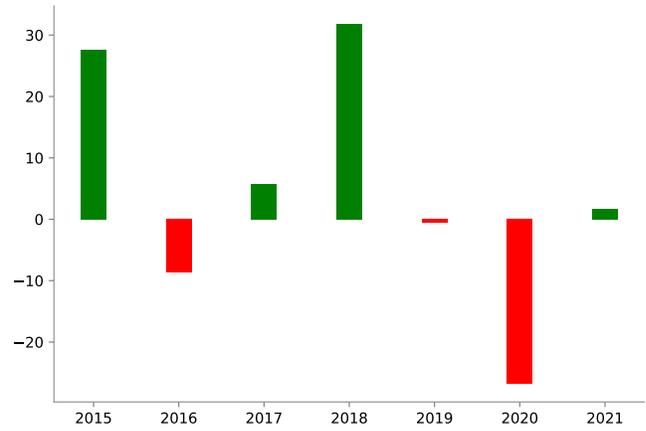


(c) Global HY

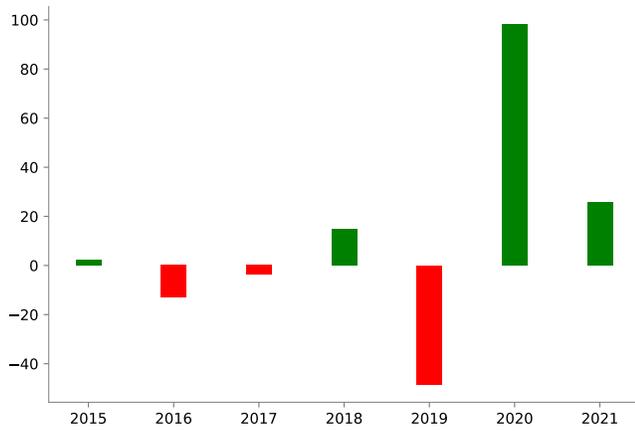
Figure 10: Calendar differences in excess and total returns in (bps)



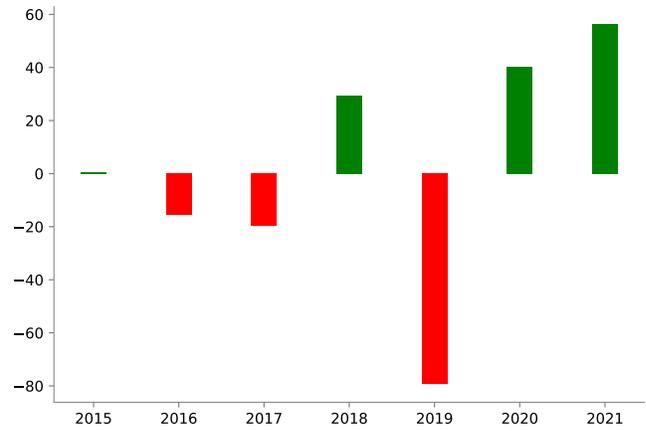
(a) EUR IG: Excess returns



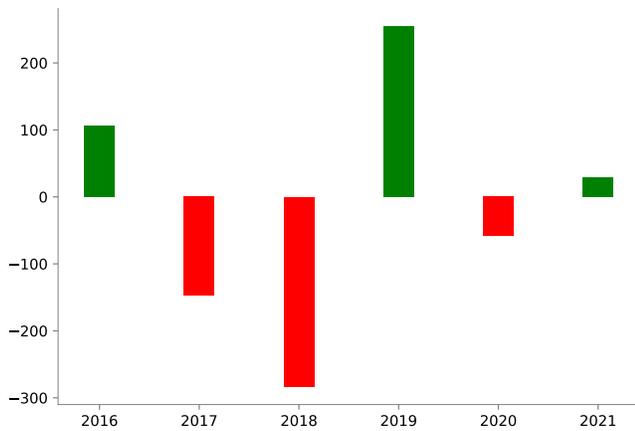
(b) EUR IG: Total returns



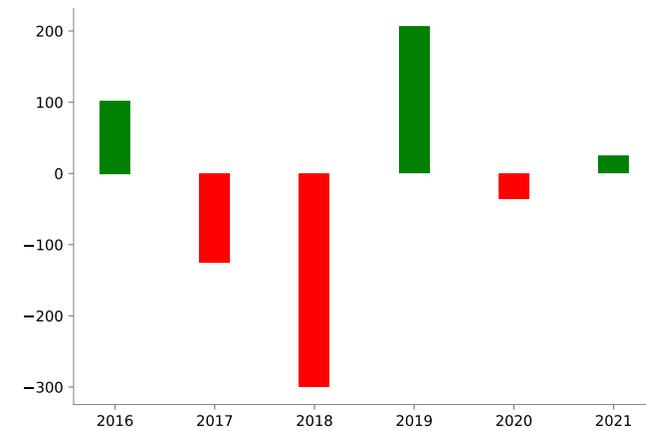
(c) USD IG: Excess returns



(d) USD IG: Total returns



(e) Global HY: Excess returns



(f) Global HY: Total returns

### A.3.2 Active management

Figure 11: Monthly excess-returns of the IG unhedged portfolio (in bps)

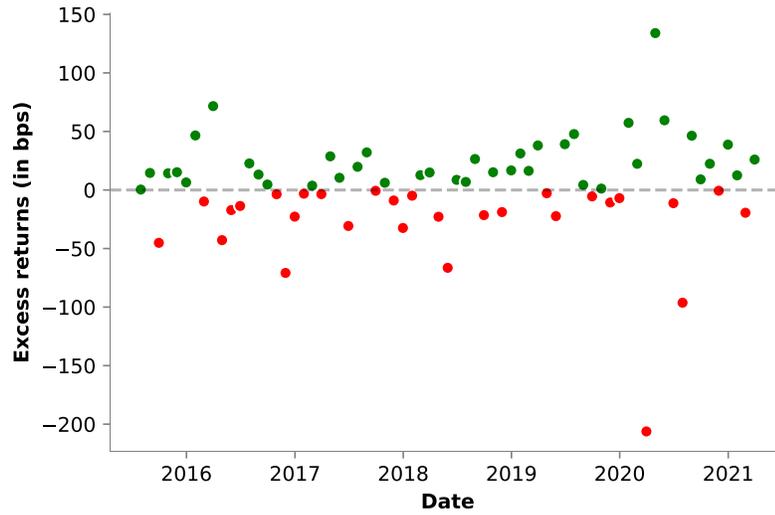
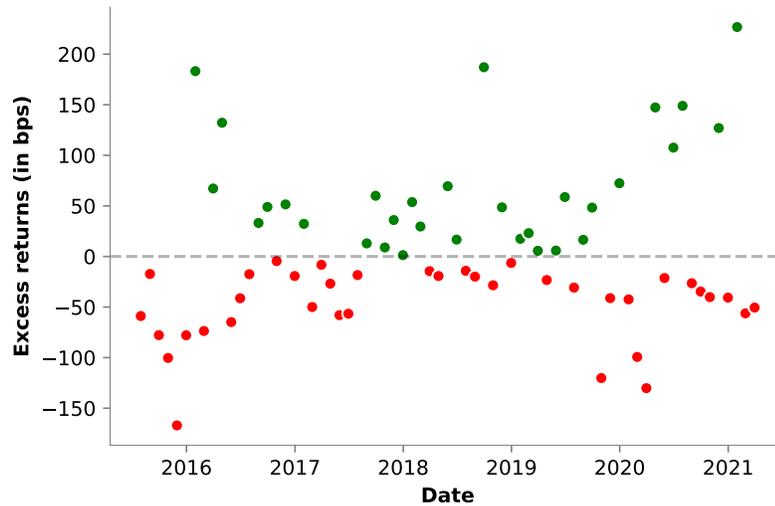


Figure 12: Monthly excess-returns of the HY unhedged portfolio (in bps)



## A.4 Tables

### A.4.1 Passive management

Table 13: Issuers and Issues in benchmarks

|                          | EUR IG | USD IG | Global HY |
|--------------------------|--------|--------|-----------|
| <b>Number of lines</b>   |        |        |           |
| Average                  | 2 364  | 5 549  | 3 327     |
| Standard deviation       | 500    | 718    | 230       |
| Median                   | 2 282  | 5 584  | 3 198     |
| Maximum                  | 3 235  | 6 948  | 3 779     |
| Minimum                  | 1 626  | 4 328  | 3 113     |
| <b>Number of issuers</b> |        |        |           |
| Average                  | 555    | 1 044  | 1 521     |
| Standard deviation       | 68     | 77     | 67        |
| Median                   | 563    | 1 055  | 1 510     |
| Maximum                  | 647    | 1 183  | 1 696     |
| Minimum                  | 423    | 930    | 1 432     |

Table 14: Issuers and Issues in optimised portfolios

|                          | EUR IG | USD IG | Global HY |
|--------------------------|--------|--------|-----------|
| <b>Number of lines</b>   |        |        |           |
| Average                  | 875    | 1 682  | 300       |
| Standard deviation       | 273    | 405    | 141       |
| Median                   | 808    | 1 742  | 268       |
| Maximum                  | 1 467  | 2 498  | 713       |
| Minimum                  | 391    | 886    | 85        |
| <b>Number of issuers</b> |        |        |           |
| Average                  | 197    | 307    | 120       |
| Standard deviation       | 48     | 58     | 51        |
| Median                   | 194    | 306    | 114       |
| Maximum                  | 274    | 420    | 274       |
| Minimum                  | 110    | 191    | 49        |

Table 15: HY Energy sector - Weights (in %) and performances (in bps)

|                                   | Weights |       | Excess returns |        |
|-----------------------------------|---------|-------|----------------|--------|
|                                   | Port    | +/-   | Port           | +/-    |
| Energy - Exploration & Production | 7.07    | 2.76  | -49.07         | -81.70 |
| Gas Distribution                  | 2.74    | -0.19 | 71.96          | 48.63  |
| Integrated Energy                 | 0.49    | -3.49 | 18.03          | -34.72 |
| Oil Field Equipment & Services    | 2.17    | 0.45  | -43.62         | -42.05 |
| Oil Refining & Marketing          | 0.08    | -0.42 | 0.90           | -1.87  |

#### A.4.2 Active management

Table 16: Calendar excess-returns for unhedged version of the IG portfolio

| Year          | Positive frequency (%) | Mean (bps) | Median (bps) |
|---------------|------------------------|------------|--------------|
| 2015          | 83.33                  | 0.96       | 10.37        |
| 2016          | 41.67                  | -1.82      | -6.73        |
| 2017          | 50.00                  | 1.79       | 1.51         |
| 2018          | 58.33                  | -2.75      | 7.79         |
| 2019          | 58.33                  | 10.81      | 2.77         |
| 2020          | 66.67                  | 6.29       | 22.39        |
| 2021          | 66.67                  | 6.36       | 12.50        |
| Entire period | 57.97                  | 2.85       | 6.17         |

Table 17: Calendar excess-returns for unhedged version of the HY portfolio

| Year          | Positive frequency (%) | Mean (bps) | Median (bps) |
|---------------|------------------------|------------|--------------|
| 2015          | 0.00                   | -83.19     | -77.85       |
| 2016          | 50.00                  | 24.57      | 14.26        |
| 2017          | 50.00                  | -5.55      | -3.44        |
| 2018          | 50.00                  | 25.19      | 5.14         |
| 2019          | 66.67                  | 2.71       | 11.18        |
| 2020          | 33.33                  | 7.96       | -30.56       |
| 2021          | 33.33                  | 40.02      | -50.51       |
| Entire period | 44.93                  | 4.05       | -14.17       |

Table 18: Performance Attribution for hedged version of the IG portfolio

| Composite Rating | Average Weight (%) |              |             | Total return (%) |             |             | Contribution to return (%) |             |             | Effects (%)   |             |             | Total attribution (%) |
|------------------|--------------------|--------------|-------------|------------------|-------------|-------------|----------------------------|-------------|-------------|---------------|-------------|-------------|-----------------------|
|                  | Port               | Bench        | +/-         | Port             | Bench       | +/-         | Port                       | Bench       | +/-         | Allocation    | Selection   | Currency    |                       |
| <b>Total</b>     | <b>25.45</b>       | <b>24.88</b> | <b>0.56</b> | <b>3.12</b>      | <b>2.88</b> | <b>0.24</b> | <b>3.12</b>                | <b>2.88</b> | <b>0.24</b> | <b>-11.74</b> | <b>0.82</b> | <b>0.61</b> | <b>0.24</b>           |
| Derivatives      | -74.69             | -75.19       | 0.51        | -3.53            | -2.87       | -0.66       | 1.02                       | 1.86        | -0.84       | -11.77        | 0.16        | 0.22        | -0.91                 |
| Fixed Income     | 100.00             | 100.00       | 0.00        | 1.91             | 0.79        | 1.11        | 2.10                       | 1.02        | 1.08        | 0.03          | 0.66        | 0.39        | 1.15                  |
| AAA              | 0.64               | 1.24         | -0.61       | 22.98            | -0.51       | 23.50       | -0.05                      | 0.01        | -0.06       | 0.12          | -0.02       | 0.01        | 0.12                  |
| AA               | 17.16              | 10.16        | 6.99        | 2.41             | 0.09        | 2.32        | 0.96                       | 0.05        | 0.91        | -0.23         | 0.16        | -0.14       | -0.20                 |
| A                | 43.22              | 42.33        | 0.89        | 0.79             | 0.58        | 0.21        | 0.00                       | 0.32        | -0.32       | 0.13          | -0.12       | 0.40        | 0.42                  |
| BBB              | 36.00              | 45.06        | -9.06       | 4.05             | 1.86        | 2.19        | 2.00                       | 0.89        | 1.11        | 0.03          | 1.05        | 0.20        | 1.32                  |
| BB               | 2.99               | 1.03         | 1.96        | 2.77             | -8.38       | 11.14       | -0.82                      | -0.23       | -0.58       | -0.35         | -0.13       | -0.08       | -0.54                 |

Table 19: Performance Attribution for hedged version of the HY portfolio

| Composite Rating | Average Weight (%) |              |              | Total return (%) |             |             | Contribution to return (%) |             |             | Effects (%)   |             |             | Total attribution (%) |
|------------------|--------------------|--------------|--------------|------------------|-------------|-------------|----------------------------|-------------|-------------|---------------|-------------|-------------|-----------------------|
|                  | Port               | Bench        | +/-          | Port             | Bench       | +/-         | Port                       | Bench       | +/-         | Allocation    | Selection   | Currency    |                       |
| <b>Total</b>     | <b>33.13</b>       | <b>18.86</b> | <b>14.27</b> | <b>6.72</b>      | <b>5.04</b> | <b>1.68</b> | <b>6.72</b>                | <b>5.04</b> | <b>1.68</b> | <b>136.69</b> | <b>0.93</b> | <b>0.89</b> | <b>1.68</b>           |
| Derivatives      | -66.96             | -81.23       | 14.27        | -3.51            | -2.91       | -0.60       | 1.88                       | 1.72        | 0.16        | 137.79        | 0.13        | 0.49        | 1.23                  |
| Fixed Income     | 100.00             | 100.00       | 0.00         | 4.68             | 3.09        | 1.58        | 4.83                       | 3.31        | 1.52        | -1.09         | 0.80        | 0.40        | 0.45                  |
| BBB              | 9.98               | 4.15         | 5.83         | -5.43            | 14.77       | -20.20      | 0.48                       | 0.73        | -0.25       | 0.31          | -1.55       | -0.46       | -1.71                 |
| BB               | 68.12              | 57.42        | 10.70        | 0.91             | 3.78        | -2.87       | 0.26                       | 2.47        | -2.20       | 0.15          | -2.63       | -0.06       | -2.44                 |
| B                | 19.15              | 32.23        | -13.07       | 40.71            | 2.25        | 38.46       | 4.90                       | 0.32        | 4.58        | -0.02         | 5.66        | 0.84        | 6.47                  |
| CCC              | 2.75               | 5.80         | -3.05        | -76.00           | 0.53        | -76.53      | -0.81                      | -0.13       | -0.68       | 0.32          | -1.51       | 0.07        | -0.84                 |
| CC               | 0.00               | 0.08         | -0.08        |                  | -1.27       | 1.27        |                            | -0.02       | 0.02        | 0.02          | 0.00        | 0.00        | 0.02                  |
| C                | 0.00               | 0.05         | -0.05        |                  | 22.23       | -22.23      |                            | -0.03       | 0.03        | 0.02          | 0.00        | 0.00        | 0.02                  |
| Not Classified   | 0.00               | 0.28         | -0.28        |                  | -7.17       | 7.17        |                            | -0.03       | 0.03        | 0.03          | 0.00        | 0.01        | 0.04                  |



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