ESG Momentum in Regional Equity Markets

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This version: January 2022

Abstract

This article investigates the use of ESG metrics for asset allocation decisions. We analyse a basic active allocation strategy within regional equity markets, assessing the usefulness of ESG information via two dimensions: the impact on active returns and the predictability of future ESG scores. Our results suggest tilting portfolios on the basis of ESG information can enhance both portfolio returns and future portfolio ESG scores.

Keywords: ESG

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The views expressed here are those of the authors alone and not of HSBC Asset Management.

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1 Introduction

With an increasing industry focus on ESG investing, practitioners and academics are attempting to understand what impact ESG has on the prospective risk and return of different investment strategies. Whilst not necessarily at the heart of the proposition itself, understanding whether investing with an ESG lens will enhance or detract from portfolio returns is important for clients investing in sustainable mandates.

There are typically two schools of thought:

- ESG investing decreases risk-adjusted returns due to placing constraints on investors, thereby compromising the breadth of bets for active return or diminishing the diversification properties of an investment (c.f. Luo and Balvers (2017, [10]))
- ESG investing increases risk-adjusted returns by incorporating new information into the decision making process which can either reduce risk, increase return, or a combination of both (c.f. Gompers et al (2003, [9]))

Our contribution to the literature is to focus on a top-down application of ESG metrics in investment strategies rather than the more conventional bottom-up approach. We do this by running a series of simple empirical tests. Studies such as Fish et al (2019, [6]) look at stock level data and seek to showcase the usefulness of ESG information by over- or under-weighting individual securities. For asset allocators, who typically operate with a less granular investment universe, security selection is either outsourced to third party managers or excluded entirely from the decision set (for example, if there is extensive use of derivatives). We therefore seek to see what value (if any) ESG information can have at an asset allocation level.

We also look to extend the analysis to focus on different dimensions of ESG investing. We move away from the classical risk-return lens and focus on what different strategies may mean for future ESG outcomes, which may be as equally important when taken from the perspective of ESG motivated investors[1]

We start with a discussion of the data and signals, before outlining the active strategy and discussing the results alongside extension/robustness checks. The final section concludes the findings.

[1] we do not formalise the trade-off here, but the idea of maximising a combination of financial and social returns is described in the work of Cooper et al (2016, [3])

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2 Data Description

2.1 Data

We use stock level ESG scores from MSCI from Dec-2007 to Apr-2021. These scores are aggregated into regional equity market scores covering five major developed market regions: US, Japan, Europe ex UK, UK and Asia. The aggregation process follows an equally-weighting scheme, motivated by the findings of Christiansen and Ducoulombier (2020, [2]) and as used in studies such as Chang et al (2020, [1]) [2]

At the start of the sample period, coverage ratios in the various markets are less than 100% and companies with missing data are assigned a zero score. This means that the regional scores improve over time simply as coverage levels increase. This is both a potential attribute and a drawback for empirical testing work; as an attribute, it means increasing levels of ESG disclosures are 'rewarded' in higher regional scores, however as a drawback it means earlier in the sample period we may be picking up changes in underlying data contributors rather than improvements in the scores themselves.

Coverage ratios for the five regions are above 95% from 2012 onwards, and reach $\geq$ 99% by mid-2017. To address some of the historical data issues, we display excess returns and score improvements in time series format so as to make clearer their evolution over different time periods. We find that our results are robust to segmentation into different time periods, and the outcomes over periods with high coverage ratios are similar to those when coverage ratios were lower.

2.2 Signals

Armed with these scores, we then consider two forms of 'signal'; the first considers the raw ESG score, whilst the second considers ESG momentum, proxied by the twelve month percentage change in ESG score.

Momentum in metrics is a natural area for active strategies because it holds a few potential benefits:

- Improving scores would mean assets receive an increasing weight in investor portfolios which are seeking to maximise their overall portfolio score
- Momentum may also be more forward-looking when thinking about future score evolution (score improvements beget further improvements)

[2] The appendix shows the results when using market capitalisation weighting schemes.

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- Using changes may increase correlations of results across different data providers, since one would hope a company improving its internal policies would be picked up by a rating agency regardless of their scoring system or methodology. Put differently, strategies based on the momentum of one set of scores should correlate highly with those using a different set of scores, addressing some of the challenges mentioned in Gidwani (2020, [8]) and Dimson et al (2020, [4])

- Momentum as a rate of change measure makes it easy to incorporate multiple metrics which have different ordinance scales (such as ESG scores and carbon intensity) and also blend with asset expected returns in a mean-variance optimisation process

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3 Investment Strategy

We consider the following optimisation routine:

$$\begin{aligned} Max\, w'S \\ s.t.\, w'1 = 0 \\ \sqrt{w'\Sigma w} \leq TE \end{aligned} \tag{1}$$

Where:

$$\Sigma = \sigma\Omega\sigma,\ \Omega = \begin{pmatrix} 1 & \bar{\rho} & \cdots & \bar{\rho} \\ \bar{\rho} & 1 & \cdots & \bar{\rho} \\ \vdots & \vdots & \ddots & \vdots \\ \bar{\rho} & \bar{\rho} & \cdots & 1 \end{pmatrix},\ \sigma = diag(\,\sigma_{US},\ \cdots\ ,\sigma_{Asia}\,)$$

S is the signal representing the raw ESG score or ESG momentum, w are the active portfolio weights which sum to zero, and TE represents the overall active tracking error budget which we set at $TE = 50bps$. For the covariance matrix Σ we stabilise the optimisation routine by using an in-sample covariance matrix fixed through time, with correlations shrunk to the average pairwise correlation across the regions $\bar{\rho}$[3]. This means that changes in weights over time are driven entirely by innovations in S and not adjustments to the risk model Σ.

3.1 Analysis

We focus on two performance metrics: excess return and predictive power on future ESG scores.

Excess return examines the performance of the tilts using standard market cap benchmark indices in local currency returns (approximating the return of a hedged investment or derivatives implementation via equity futures contracts).

Predictive power on future ESG score looks at the frequency with which the tilts lead to an improvement in score over the following twelve-month period.

The frequency of improvement is measured via a simple Hit Ratio:

$$HitRatio_{t+12m} = \frac{\sum_{t=1}^{T} 1_{w_{A,t}(S_{t+12m}-S_t)>0}}{T} \tag{2}$$

[3]This attempt at stabilisation is inadequate for practical portfolio implementation since we are still optimising amongst highly correlated assets. Instead, further adjustments to the mean-variance programme need to be considered, or a different allocation approach such as cross-sectional ranking can be used.

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4 Performance

Figures 1 and 2 display the performances of an ESG tilting strategy based on raw ESG scores. We can see this has a negative impact, both in terms of excess returns and future score prediction. A timeseries of active weights in Figure 5 shows a persistent tilt towards European equity markets (EUxUK and UK) at the expense of US equity markets, which explains the persistent performance drag. Moreover, a strategy of this type has no predictive power for future ESG scores; improving a portfolio's ESG score today actually leads to a lower ESG score in the future.

Figures 3 and 4 display the performances of an ESG tiling strategy based on ESG momentum. Here we see a transformed picture; excess returns are both strong and persistent over time, whilst two-thirds of the time we see an improvement in future ESG scores. The timeseries of active weights in Figure 6 showcases a very dynamic strategy and we discuss the implications of this turnover in a later section.

4.1 Robustness Checks

4.1.1 Factor Analysis

The first part of our robustness testing is to see whether tilting based on ESG metrics is subsumed by previously discovered equity factors. We consider two sets of factor definitions; one based on the five factors of Fama and French (2015, [5]) and one based on four 'macro' factors.

We first run a Fama-French five factor analysis by regressing the monthly excess returns on to five factors: Mkt-RF, SMB (Small Minus Big), HML (High Minus Low), RMW (Robust Minus Weak), CMA (Conservative Minus Aggressive). Factor returns are sourced from Ken French's website[4].

Table 1 shows the results. We see that the ESG score has a negative loading on the market return, whilst ESG momentum has a negative loading on the value factor.

Given that Fama-French factors are built upon individual stocks listed in the US and are therefore not directly aligned with our investment universe (regional equity market indices), the strong relationship to the negation of Market and Value for ESG score and ESG momentum respectively could be more spurious than meaningful. To further investigate this behaviour, we seek to create an alternative set of equity cross-sectional macro factors

[4] `https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html`

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Factor	ESG Score	ESG Momentum
Intercept	-0.0001	0.0002*
MKT	-0.0833***	0.0032
SMB	-0.0484	0.0286
HML	0.0264	-0.1580***
RMW	-0.0115	0.0850
CMA	0.1131*	0.0822

Table 1: Fama-French five factor regression analysis, *,**,*** denotes significance at 10%, 5% and 1% levels respectively

which might be more suitable for our universe. We build a set of four equity factors based on regional factor indices. Excess returns are decomposed into four 'macro' factors: Market, Value, Carry, and Momentum, with definitions provided below:

- **Market** average return across 5 regions (US, Japan, Europe ex UK, UK and Asia)
- **Value** sum of the returns of the two regions with lowest P/E ratios minus the sum of the returns of the two regions with highest P/E ratios
- **Carry** sum of the returns of the two regions with highest ROE minus the sum of the returns of the two regions with lowest ROE [5]
- **Momentum** sum of the returns of the two best-performing regions over the previous twelve months minus the sum of the returns of the two worst-performing regions

We then perform a multi-variate regression using these four factors. Table 2 shows the results.

Factor	ESG Score	ESG Momentum
Intercept	-0.0001	0.0002**
Market	-0.0380*	-0.0603**
Value	0.0667***	-0.0476**
Carry	0.0375*	0.0225
Momentum	-0.0256	0.0322

Table 2: Macro factor regression analysis, *,**,*** denotes significance at 10%, 5% and 1% levels respectively

The ESG score strategy has a positive loading on the 'Value' factor, as would be expected given the regional biases discovered in Figure 5. The ESG momentum strategy has

[5] 'Carry' here may be more closely associated with the traditional definition of Quality/Profitability given the use of Return on Equity as opposed to Dividend Yield

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a statistically significant alpha, and also has a negative loading on the 'Market' and 'Value' factors, which may indicate a degree of defensiveness in the strategy. The negative value exposure somewhat confirms the findings from the Fama-French analysis, whilst low correlation between the Market and Value factors[6] reduces the chances of a multicolinearity issue

4.1.2 Turnover Analysis

Table 3 gives the annualised turnover of the two approaches with different rebalancing frequencies.[7]

ESG scores monthly	ESG momentum monthly	ESG scores quarterly	ESG momentum quarterly
5%	40%	3%	23%

Table 3: Annualised Turnover of ESG tilting strategies, (%)

Clearly, the higher turnover on the momentum strategy when rebalanced monthly is potentially challenging from a practical standpoint. When embedding transaction costs to the analysis, using the data from Table 4 we estimate the annualised alpha declines by 1bps on this strategy. This is quite marginal, and therefore transaction costs have a limited impact on the strategy's performance.

Asset	Bid-Ask Spread Est.(bps)
US Equity	2
Japan Equity	2
Europe ex UK Equity	2
UK Equity	2
Asia Equity	5

Table 4: Transaction Costs and Bid-Ask Spread Estimates

4.1.3 Universe Adjustment

We may also wish to consider a simplified investment universe for the purposes of improving investability and reducing transaction costs. Figures 7 and 8 display the results when using a three region universe comprised of US, Europe and Japan.

[6] $\rho = -0.09$

[7] Figures 11 and 12 display the results of the momentum strategy when using a quarterly rebalancing frequency.

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Strategy Regions	ESG momentum five	ESG momentum three
Alpha	0.31%	0.22%
IR	0.70	0.52
Turnover	40%	27%
Fwd score hit ratio	66%	58%

Table 5: Comparison of ESG momentum strategies across five and three regions

5 Conclusion

We present findings which show ESG momentum to be a value-adding investment strategy at an asset allocation level, both in terms of classical performance measures (alpha) and sustainability measures (future ESG scores). The analysis is robust to basic factor/transaction cost/rebalancing frequency/universe definition analyses.

As a purely empirical exercise, this paper only showcases a specific set of outcomes using a specific set of inputs and therefore does not tackle the bigger question of why this result exists and whether it may persist in future. However, similar to the work of Nagy et al. (2015, [11]), we can see that a momentum strategy based on ESG metrics is attractive from a historical perspective. Following the work of Gabaix and Koijen (2021, [7]), a flows-based explanation for the result may be the most justifiable, particularly given the increasing AUM of ESG investment strategies, however a full examination of this relationship is beyond the scope of this paper.

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6 Appendix

6.1 Performance

Figure 1: Cumulative excess return when tilting based on ESG scores.
The figure shows the cumulative excess return evolution for the strategy based on ESG scores. The sample period is from December 2007 to April 2021. The strategy has an annualised excess return of -0.22% and an Information Ratio of -0.54

Figure 2: Future ESG score improvement.
The figure shows the twelve month forward improvement in ESG score from the strategy based on ESG scores. The sample period is from December 2007 to April 2020. The strategy has a hit ratio for improvement of 30%

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Figure 3: Cumulative excess return when tilting based on ESG momentum.
The figure shows the cumulative excess return evolution for the strategy based on ESG momentum. The sample period is from December 2008 to April 2021. The strategy has an annualised excess return of 0.31% and an Information Ratio of 0.70

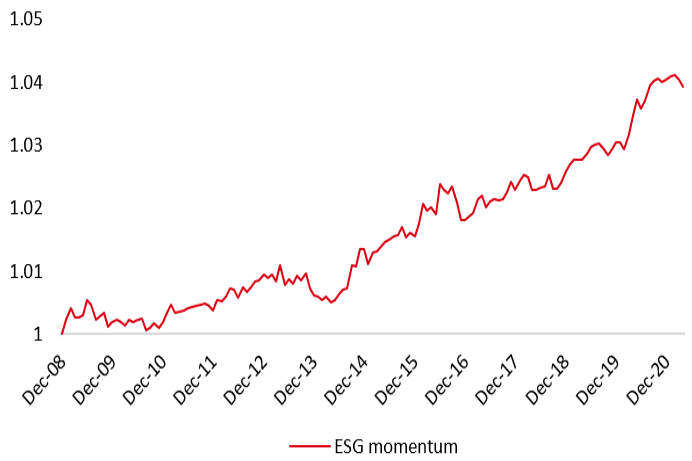
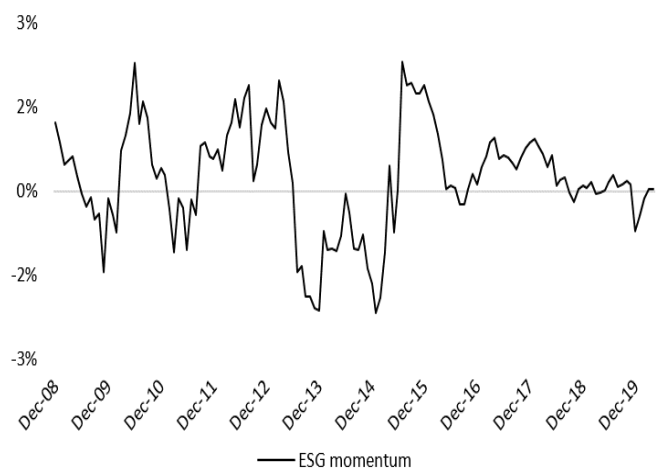


Figure 4: Future ESG score improvement.
The figure shows the twelve month forward improvement in ESG score from the strategy based on ESG momentum. The sample period is from December 2008 to April 2020. The strategy has a hit ratio for improvement of 66%



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6.2 Active weights

Figure 5: Active weights when tilting based on ESG scores.
The figure shows the active weights for the strategy based on ESG scores with a TE of 50*bps*. The sample period is from December 2007 to April 2021. The strategy is rebalanced monthly and has an annualised turnover of 5%

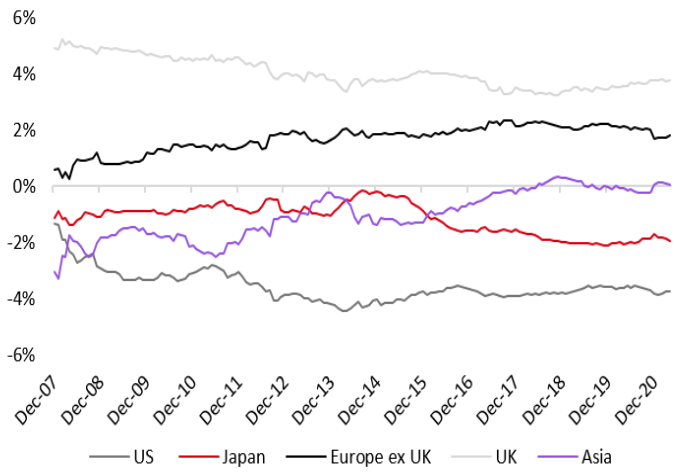
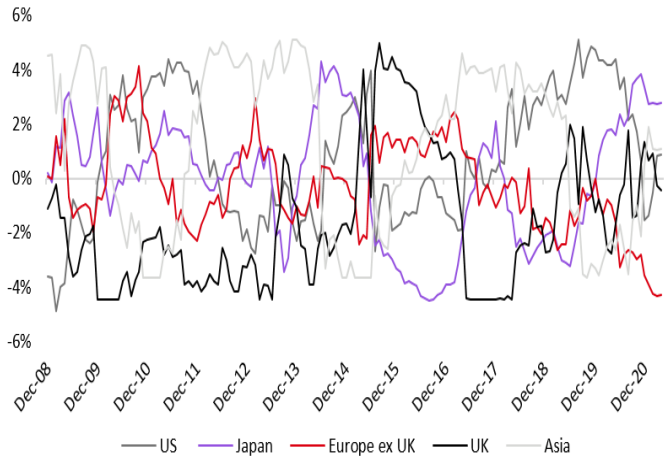


Figure 6: Active weights when tilting based on ESG momentum.
The figure shows the active weights for the strategy based on ESG momentum with a TE of 50*bps*. The sample period is from December 2008 to April 2021. The strategy is rebalanced monthly and has an annualised turnover of 40%



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6.3 Three regions

Figure 7: Cumulative excess return when tilting based on ESG momentum across US, Europe and Japan.
The figure shows the cumulative excess return evolution for the strategy based on ESG momentum in three equity market regions. The sample period is from December 2008 to April 2021. The strategy has an annualised excess return of 0.22% and an Information Ratio of 0.52

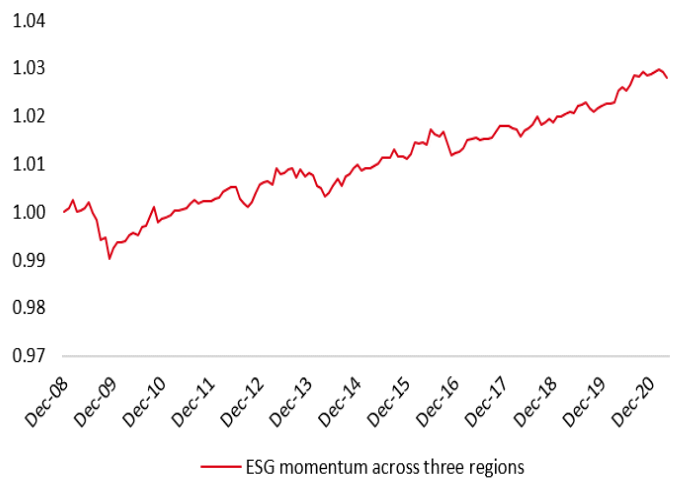
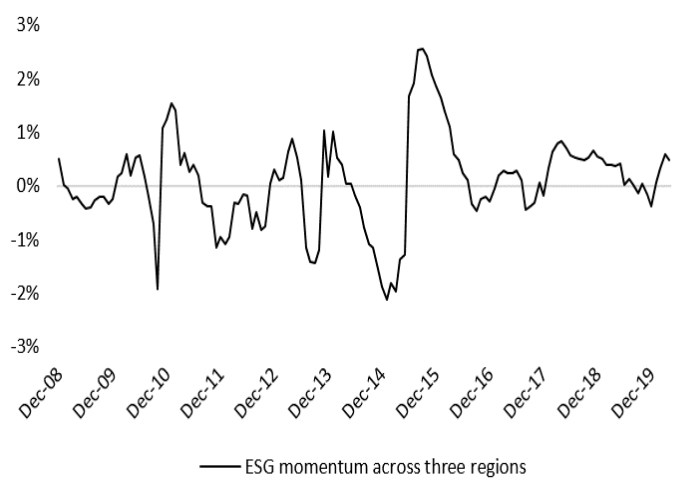


Figure 8: Future ESG score improvement.
The figure shows the twelve month forward improvement in ESG score from the strategy based on ESG momentum in three equity market regions. The sample period is from December 2008 to April 2020. The strategy has a hit ratio for improvement of 58%



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6.4 Market Capitalisation weighting scheme

Figure 9: Cumulative excess return when tilting based on ESG momentum with market cap. weighting.
The figure shows the cumulative excess return evolution for the strategy based on ESG momentum with market cap. weighting. The sample period is from December 2008 to April 2021. The strategy has an annualised excess return of 0.18% and an Information Ratio of 0.41

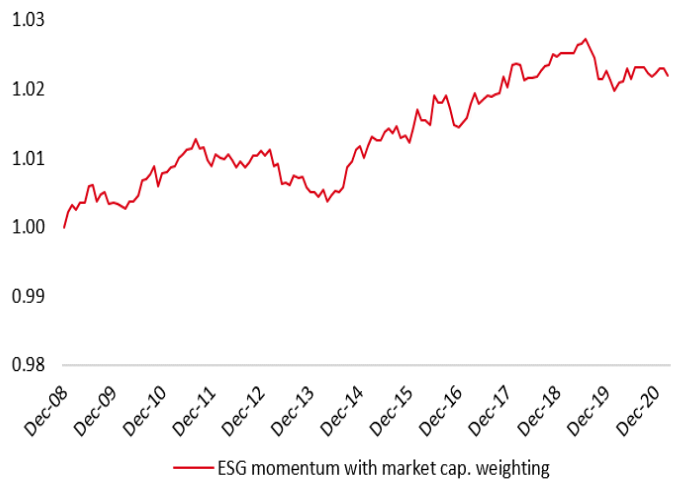
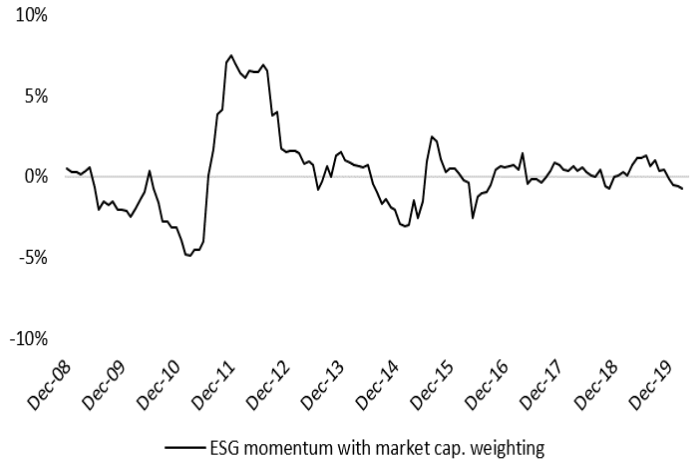


Figure 10: Future ESG score improvement with market cap. weighting.
The figure shows the twelve month forward improvement in ESG score from the strategy based on ESG momentum with market cap. weighting. The sample period is from December 2008 to April 2020. The strategy has a hit ratio for improvement of 57%



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6.5 Quarterly rebalancing

Figure 11: Cumulative excess return when tilting based on ESG momentum with quarterly rebalancing.
The figure shows the cumulative excess return evolution for the strategy based on ESG momentum with quarterly rebalancing. The sample period is from January 2009 to April 2021. The strategy has an annualised excess return of 0.24% and an Information Ratio of 0.67

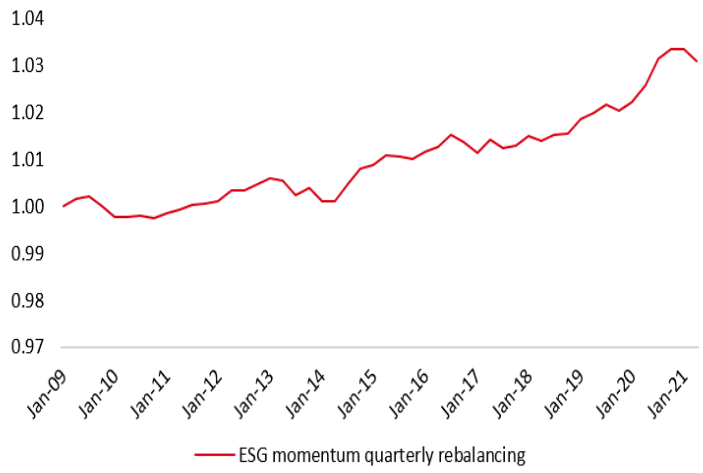
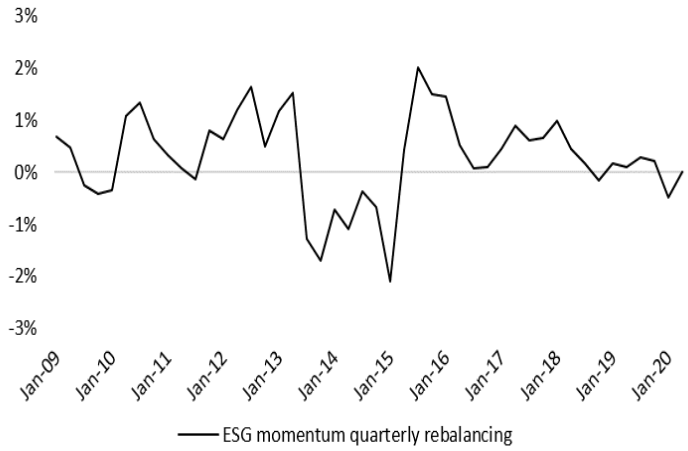


Figure 12: Future ESG score improvement with quarterly rebalancing.
The figure shows the twelve month forward improvement in ESG score from the strategy based on ESG momentum with quarterly rebalancing. The sample period is from January 2009 to April 2020. The strategy has a hit ratio for improvement of 70%



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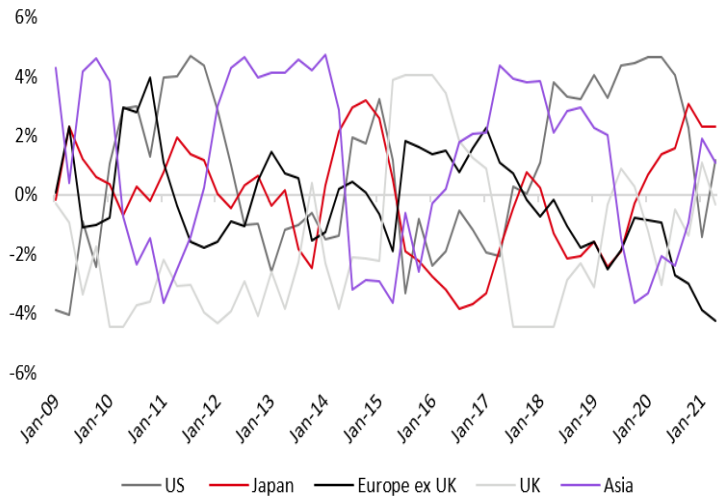
6.5.1 Quarterly rebalancing, Active weights

Figure 13 below shows the active weights for the ESG momentum strategy with quarterly rebalancing.

Figure 13: Active weights when tilting based on ESG momentum at a quarterly frequency. The figure shows the active weights for the strategy based on ESG momentum with a TE of 50*bps*. The sample period is from January 2009 to April 2021. The strategy is rebalanced quarterly and has an annualised turnover of 23%



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