StarMine Smart Holdings Plus

Behavioural finance meets ESG as alternative data: Predicting smart money's next move with StarMine

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LSEG DATA & ANALYTICS

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Introduction to Smart Holdings Plus

In today's stock market, Environmental, Social, and Governance (ESG)-focused investors play a significant role, even if you are not one of them; anticipating the actions of active institutional investors can be advantageous for any quantitative investor. This white paper introduces and explains our Smart Holdings Plus model, and most importantly shows consistent and strong performance of the Smart Holdings Plus model, both in relation to the previous model and against market-standard benchmarks.

Smart Holdings Plus is the first StarMine quantitative finance model to integrate underlying ESG indicators into the approach. This behavioural finance model combines ESG factors with traditional financial factors to predict which stocks will be most appealing to institutional investors, often referred to as "smart money." By analysing recent purchasing behaviour over the past three months - as recorded in 13-F Filings and Lipper Mutual Fund Holdings - a factor preference profile can be created for each active investor. Each publicly traded company is then evaluated against these institutional investors' preferences matrices to determine, in aggregate, how attractive the stock is to smart money. Rather than chasing past purchases of popular stocks, this model predicts which stocks are likely to experience increased buying or selling pressure from smart money and thus indicate up or downside to current pricing.

This model builds upon the original Smart Holdings model released in 2011, which considered 25 traditional financial factors across categories such as value, growth, profitability, leverage, momentum, and analyst sentiment. At that time, sustainability was not a major consideration among institutional investors, nor were there many robust sustainability content sets available. ESG themes have since gained immense popularity and data coverage, with over $3 trillion AUM across more than 7,500 base funds labelled as sustainability focused as of end of 2024. Despite geopolitical themes driving volatility for in- and out-flow patterns in recent quarters, the long-term AUM trend is of stable growth, with current AUM more than double that of Q1 2020 ($1.34trn)[1].

Regardless of one’s personal views on ESG, a significant number of market participants now consider ESG factors both in terms of thematic investing behaviours and recognition of the value as alternative data, making it prudent to anticipate their behaviours from a game theory perspective. Through a rigorous quantitative selection process mixed with subject matter expertise, Smart Holdings Plus has added 13 new quantitative indicators into the factor universe, spanning the Environment, Social, and Governance pillars. This results in a more adaptive model with enhanced performance when sustainability trends. When sustainability is not popular, the model performs similarly to the original Smart Holdings model, which relies solely on traditional financial factors.

The Smart Holdings Plus model incorporates various robust LSEG content sets. Recent institutional investor purchasing behaviour is derived from the Ownership content set, while stock factors are calculated from the Pricing, Fundamentals, I/B/E/S Estimates, StarMine SmartEstimates, and ESG point-in-time content sets. Although smart money preferences may change slowly over time, individual stock factors can change daily, especially those using Pricing and Estimates. The final model output is a 1-100 rank, from bearish to bullish, across rank universes of global, regional, country, sector-region, or industry-region.

Market-neutral spread returns have been notably strong across various regions and years since the pure out-of-sample date of Q1 2021. Smart Holdings Plus has consistently outperformed the original Smart Holdings model in cumulative spread returns across all regions, most recently 3.25% higher over the 2024 period when considering a long-short decile approach across all regions, and 65.3% higher over the 2015-2024 period. The top decile cumulative returns have consistently surpassed the full universe cumulative returns across all regions, notably 12 out of 13 years, signalling an attractive opportunity for long-only investors. When assessed regionally, Developed Europe performs exceptionally well relative to other regions. Correlations to other flagship StarMine models are also low, suggesting this quantitative finance model could be an excellent addition to existing trading strategies.

[1] Lipper Global Responsible Investments Fund Market Statistics, February 2025

Model Overview

Model Components

Smart Holdings Plus is structured in the same way as its predecessor, consisting of two main components: the Screening Component and the Change Component.

Screening Component

The Screening Component evaluates how many active institutional investor screens a particular stock has passed, essentially measuring its attractiveness to smart money. Using our proprietary behavioural finance algorithm, we identify the factors that matter most to each institutional investor. This purchasing profile includes not only a list of important factors but also a weighting based on the relative importance of each factor to each investor. By applying this factor preference matrix, we determine which companies are attractive to each investor. Additionally, we incorporate a saturation adjustment to temper a stock's attractiveness if an investor already holds many of its peers. This is powered by the proprietary StarMine Peers algorithm, which identifies related companies by analyst coverage overlap. Finally, we aggregate all institutional investor preference matrices and rank all tradeable stocks on a 1-100 attractiveness scale.

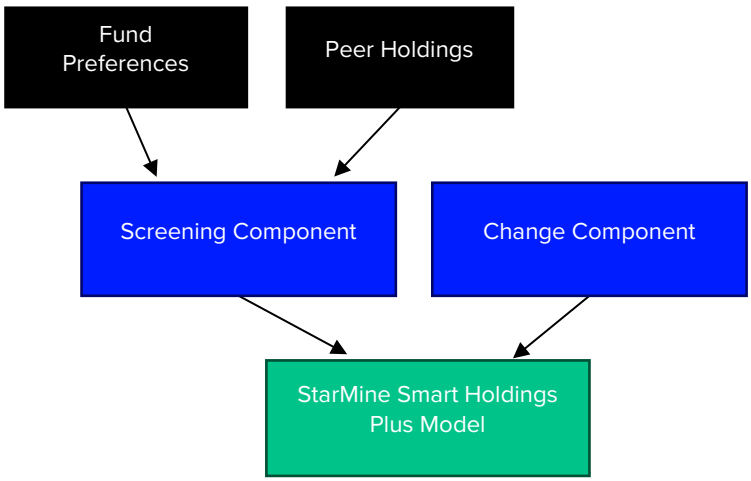
Change Component

The Change Component assesses the novelty of a stock's attractiveness. We assume that skilled institutional investors are well aware of companies that fit their investment strategy. If a stock has passed their screen a long time ago, they likely already own it or have a good reason for not holding it. However, when a new stock suddenly passes their screen—often referred to as a "new idea"—it attracts more attention. For example, a value investor might discover a company with strong fundamentals that has recently experienced a significant stock price drop, making its price ratios more attractive. The novelty of this new stock passing their investment strategy screen would likely result in increased buying pressure. The Change Component captures this phenomenon by ranking stocks 1-100 based on how their attractiveness to smart money investors has recently grown. Using this component alone allows one to monitor stocks most likely to trend with smart money investors, though it may result in a high turnover portfolio.

Smart Holdings Plus Score

The final Smart Holdings Plus 1-100 rank optimally blends the Screening Component and Change Component, ensuring a balanced measure of overall attractiveness and novelty.

Figure 1: Construction of Smart Holdings Plus



New ESG Factors

Smart Holdings Plus introduces 13 ESG factors to complement the existing set of traditional financial factors. These factors are used to generate preference profiles for each active institutional investor. In line with our typical approach at StarMine, we selected these factors through a combination of quantitative analysis and subject matter expertise.

Over the years, the amount of ESG point-in-time content has grown significantly, now encompassing over 630 data points. Clearly, it was impractical and likely to lead to multicollinearities to include all these ESG factors in the enhanced model, so we were selective in our approach. Our first criterion was coverage, favouring ESG data points with the best relative coverage and avoiding niche factors (e.g., tobacco revenue). We also sought a differentiated numerical distribution, as factor preference calculations are derived by relative ranking. This meant excluding binary factors (e.g., alcohol retailing – true/false) and factors where a single mode value dominated the distribution (e.g., litigation expense to revenue = 0). Additionally, we calculated a GINI coefficient to exclude factors where a limited set of values dominated the distribution (e.g., strictly independent board members).

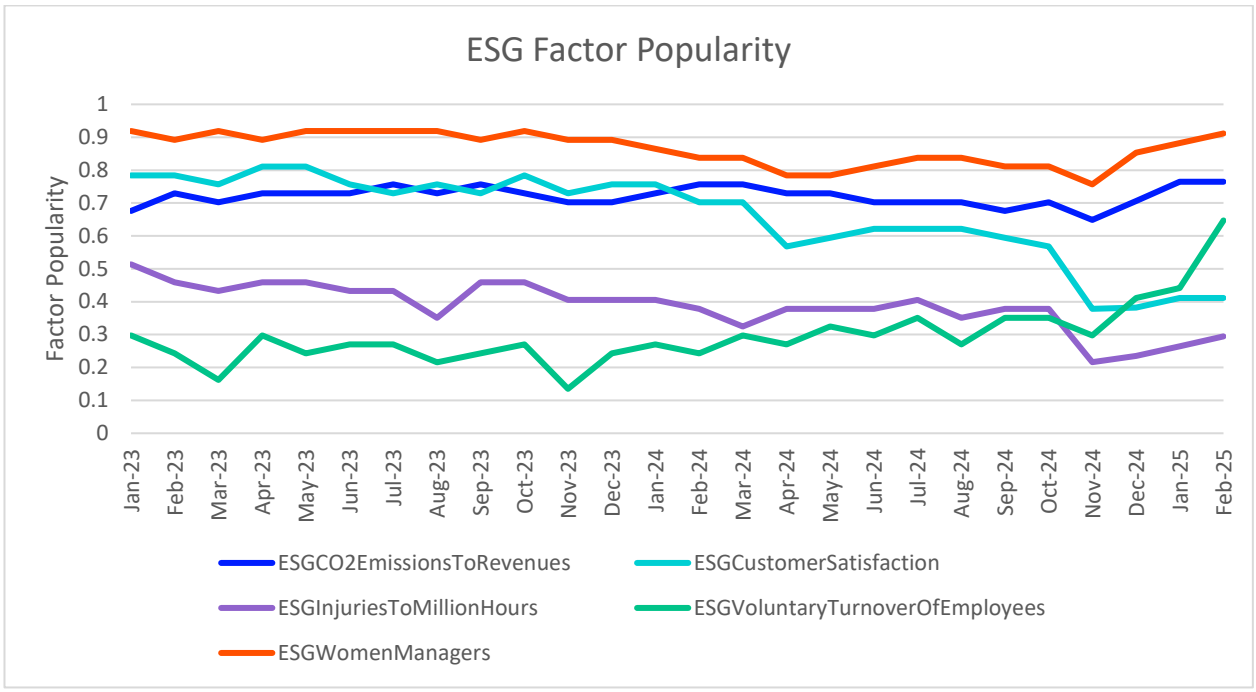
As the number of ESG factors became more manageable, we performed a cluster analysis to identify similar factors, ensuring we did not overweight the same concept. We applied subject matter expertise when analysing these clusters, choosing Total CO2 over the highly correlated SOX or NOX. Since we are comparing various types of companies, we preferred normalised factors, such as CO2/Revenue instead of just CO2.

With a refined set of ESG factors passing these quantitative screens, we integrated them into our research process for further refinement. We examined whether a factor's popularity across all active investor preference profiles changed over time. We were interested in factors that changed in popularity, albeit slowly, as shifts in smart money preferences could lead to opportunities. Therefore, any ESG factor that was always at the top of popularity (e.g., Donations/Revenue) was not useful for alpha generation, while factors always at the bottom had no algorithmic effect. Consequently, we removed all ESG factors that never changed their popularity rank over time. Finally, we performed a bit of alpha-driven optimization to narrow down to the final set of 13 ESG factors. Note that polarity is aligned such that positive ESG attributes (e.g., lower CO2 emissions, higher percentage of women managers) receive higher ranks.

Table 1: Indicators forming the ESG components of Smart Holdings Plus

Environment	Social	Governance
Total CO2 Equivalents Emissions to Revenues	Women Managers	Management Category Score
VOC Emissions to Revenues	Average Training Hours	Shareholders Category Score
Total Waste to Revenues	Injuries to Million Hours	
Total Hazardous Waste to Revenues	Voluntary Turnover of Employees	
Water Pollutant Emissions to Revenues	Customer Satisfaction	
Total Renewable Energy to Energy Use		

Figure 2: ESG Factor Popularity over time, 5 of 13 selected for easier readability and to highlight interesting trends.



Despite recent political shifts, Low Carbon (CO2/Revenue) and the percentage of Women Managers remain popular among active institutional investors, likely because they indicate long-term investment potential. Conversely, Customer Satisfaction is losing favour, suggesting a shift in the balance of power between companies and consumers. Meanwhile, the rising popularity of Employee Voluntary Turnover as a metric indicates that employees choosing to leave may signal significant concerns about a company in the current economic climate.

Original Financial Factors

This Smart Holdings Plus white paper sufficiently covers the most important aspects of the original Smart Holdings model. However, if you wish to learn even more about the original Smart Holdings model, you can review the *StarMine Smart Holdings model (Sargent, Renick, 2011*) white paper. Here is an excerpt of the original financial factors used in this Smart Holdings Plus model.

Table 2: Indicators forming the traditional financial components of Smart Holdings Plus

Value	Growth	Leverage	Momentum	Profitability	Analyst Sentiment
F12m E/P	FY1 EPS Growth	Debt/Equity	6m Price Change	ROE	FY1 EPS Chg
T12m CF/P	FY1 REV Growth	Debt/Assets	12m vs. 1m Price Change	ROA	FY2 EPS Chg
T12m B/P	F5Y EPS CAGR	Interest Coverage	T30d Volume	Net Margin	Mean Recommendation Chg
T12m EV/EBITDA	T5Y EPS CAGR			Change in Accruals	
T12m Div/P	EPS Long Term Growth Mean				
F12m Div/P					
F12m EV/Sales					

Figure 3: Traditional Financial Factor Popularity over time, 5 of 24 selected for easier readability and to highlight interesting trends.

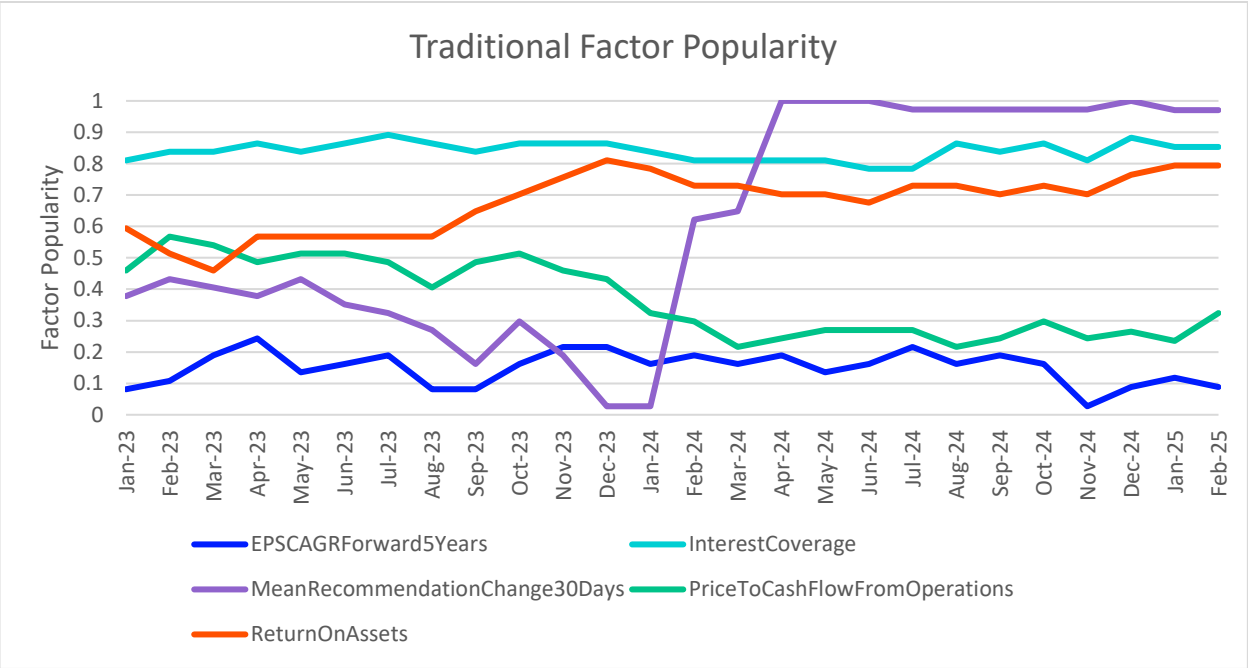


Figure 3 shows the relative popularity of selected factors over time, chosen to highlight various trends. We observe that recently, Analyst Sentiment (Mean Recommendations) and Profitability (ROA) have gained popularity, indicating a growing reliance on sell-side stock experts and a focus on tangible results. Leverage (Interest Coverage) has maintained its consistent popularity, likely reflecting concerns over the rising cost of credit. Meanwhile, EPS Forward 5-Year CAGR remains unpopular, suggesting that growth is not a primary focus for active institutional investors.

Additional New Changes

While the primary research effort for the Smart Holdings Plus model focused on selecting the best ESG factors, we also made some slight adjustments to the original algorithm.

The original model considered only U.S.-based fund managers and institutions. In contrast, the new model removes this restriction, encompassing all smart money investors with an active style who meet the same assets under management (AUM) threshold.

Previously, the model focused on positive net buying behaviour over the past three months to form each institutional investor's purchasing profile. The updated model now includes consideration for stronger conviction buys, ensuring that smaller maintenance buys are not mistaken for high-conviction investments.

The original model utilised 25 traditional financial factors. Today, the Smart Holdings Plus model incorporates 37 factors, including 13 new ESG factors and 24 of the original financial factors. We removed the T30d Volume factor from the new model. Our analysis revealed that T30d Volume consistently ranked among the most popular factors. Given our quantitative approach to selecting new ESG factors, we avoided factors that never changed in popularity over time, as they offered no opportunity to identify emerging trends and capitalize on them. Consequently, T30d Volume was deemed unsuitable for this new approach.

Model Performance

Overall Performance

The Smart Holdings Plus model was trained on data from March 31, 2010 to March 31, 2021, with 25% held out-of-sample. Data after March 31, 2021, is purely out-of-sample, marking the completion of the research phase. Our key performance metric during the research phase was the decile spread, where we long the top 10% and short the bottom 10%. We analysed performance across different regional universes, each excluding microcaps. The universe for each region mirrors the approached used in our StarMine Monthly Performance Report.

Performance has been strong across regions and years, particularly in the recent out-of-sample period. With ESG factors gaining prominence, it is crucial to monitor their popularity and consider a stock ranking signal that adapts to buyside factor popularity.

Table 3: Regional Decile Spread Returns by Year

	North America	Developed Europe	DevelopedAsia	Japan	Emerging Markets	Global
2012	6%	21%	21%	-5%	23%	16%
2013	13%	39%	32%	7%	23%	21%
2014	11%	28%	8%	9%	15%	17%
2015	15%	30%	2%	8%	-8%	21%
2016	11%	9%	36%	-16%	35%	9%
2017	1%	22%	41%	17%	30%	18%
2018	2%	13%	36%	4%	13%	9%
2019	-1%	16%	23%	4%	5%	4%
2020	-44%	-16%	-6%	-10%	13%	-28%
2021	53%	26%	20%	10%	16%	31%
2022	79%	41%	26%	4%	27%	53%
2023	-2%	26%	22%	7%	6%	7%
2024	16%	27%	15%	6%	19%	19%

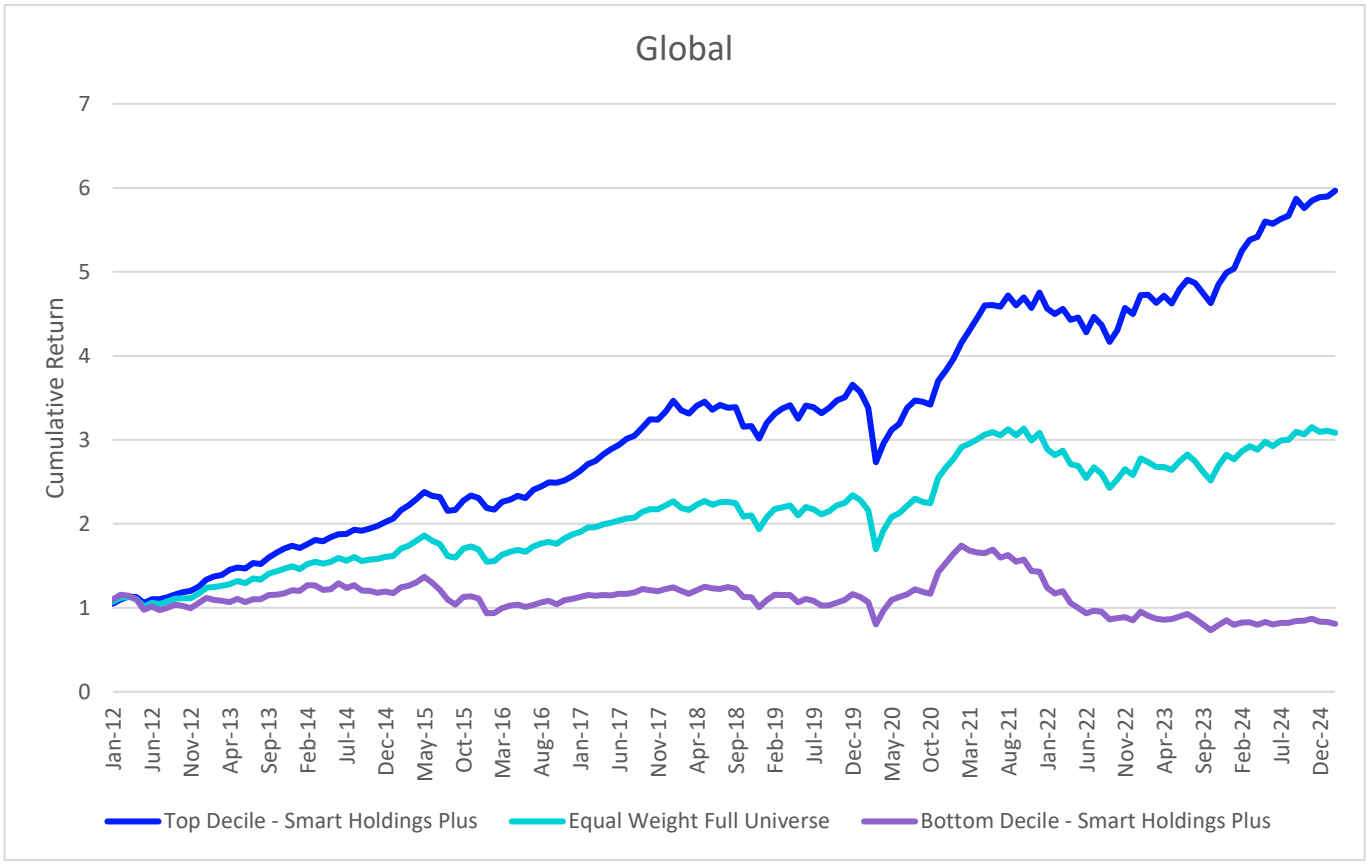
See the Appendix for a more thorough breakdown of performance and regional universe size.

Regional performance against original Smart Holdings model

Comparing the new Smart Holdings Plus to the original Smart Holdings model, we observe an impressive improvement in the recent out-of-sample period. This demonstrates the alpha potential of considering ESG factors when approached intelligently.

Figure 4a: Smart Holdings Plus vs. Original Smart Holdings Cumulative Spread Returns, Global

Figure 4b: Smart Holdings Plus Top Decile, Bottom Decile vs. Full Universe Cumulative Returns, Global



Aligned with regional trends, the Global portfolio encompassing all regions demonstrated significant improvement in market-neutral spread returns around 2015 by incorporating ESG factors into Smart Holdings. Additionally, it appeals to long-only investors, evidenced by the top decile outperforming an equal-weighted full universe.

Figure 5a: Smart Holdings Plus vs. Original Smart Holdings Cumulative Spread Returns, Developed Europe

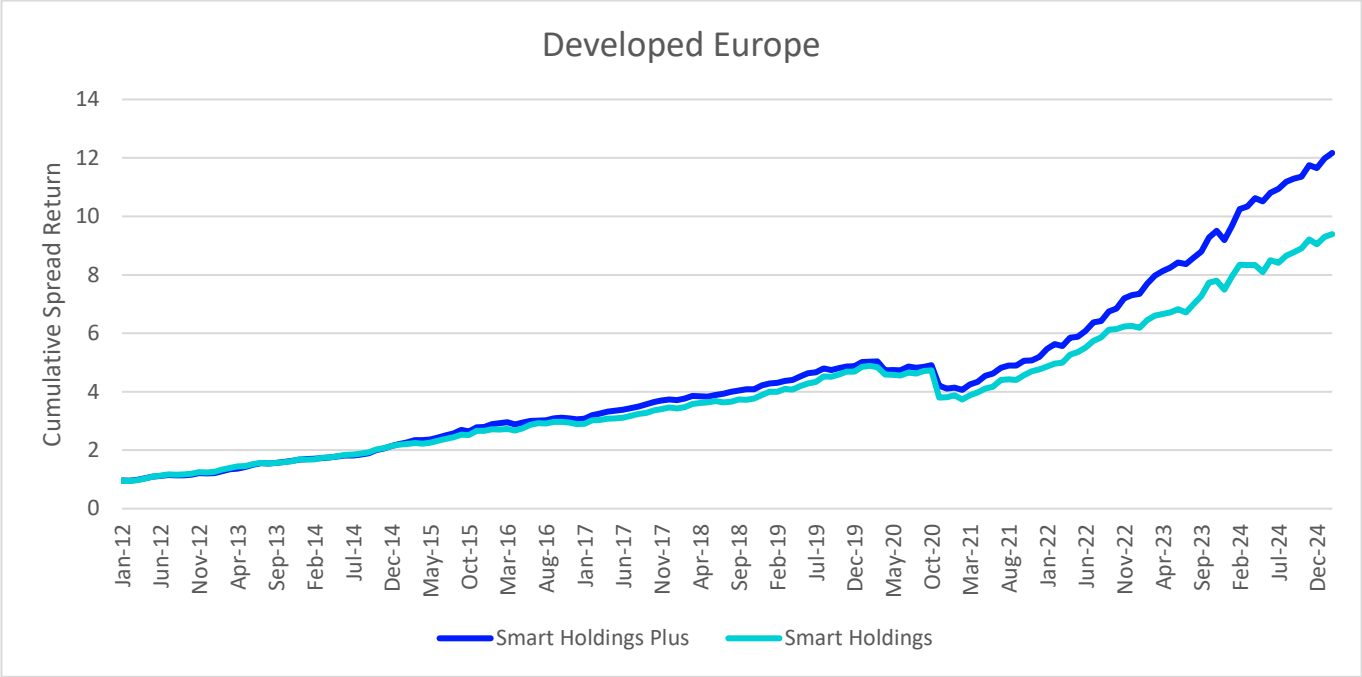
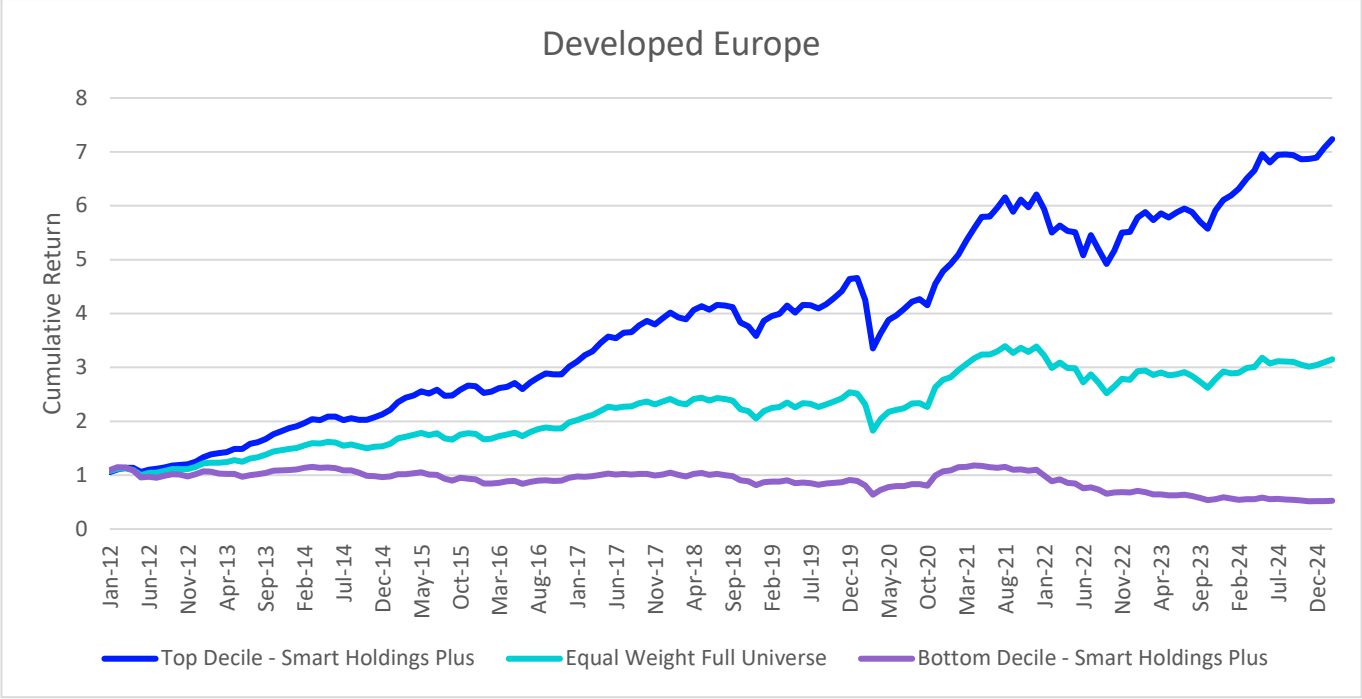


Figure 5b: Smart Holdings Plus Top Decile, Bottom Decile vs. Full Universe Cumulative Returns, Developed Europe



Developed Europe has seen a significant boost since 2020 by incorporating ESG factors into the Smart Holdings algorithm, aligning with anecdotal evidence that Europe is often a leader in ESG and sustainability-focussed investing. Among the major regions studied, it has the highest Decile Spread Return in 2023 and 2024, indicating contemporary relevance during the out-of-sample period.

Figure 6a: Smart Holdings Plus vs. Original Smart Holdings Cumulative Spread Returns, North America

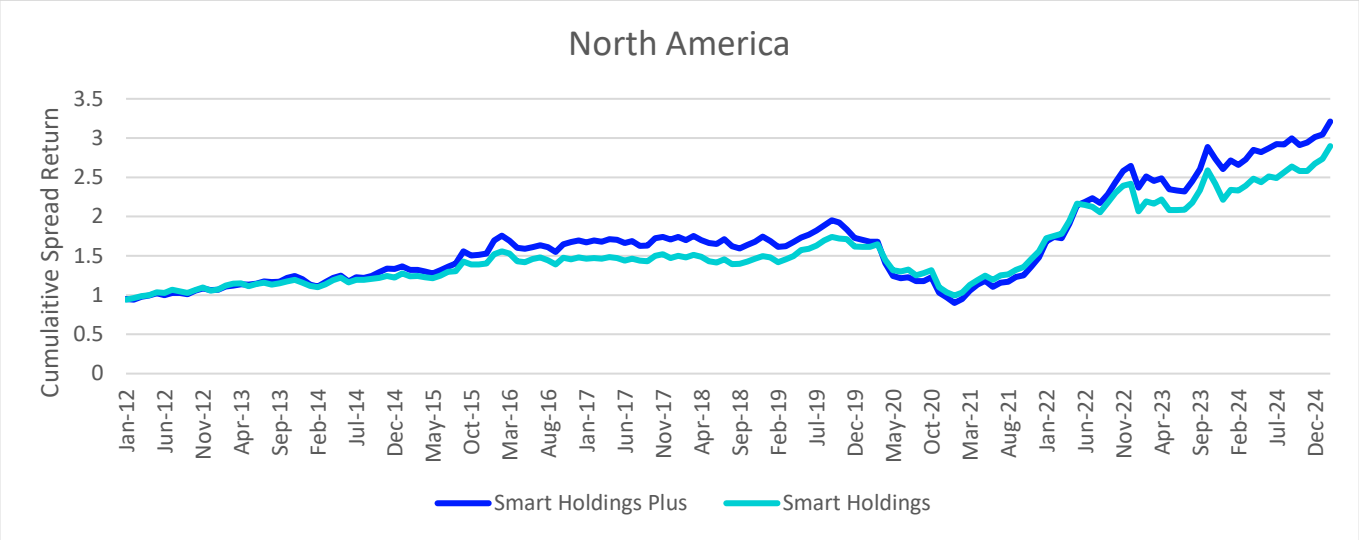
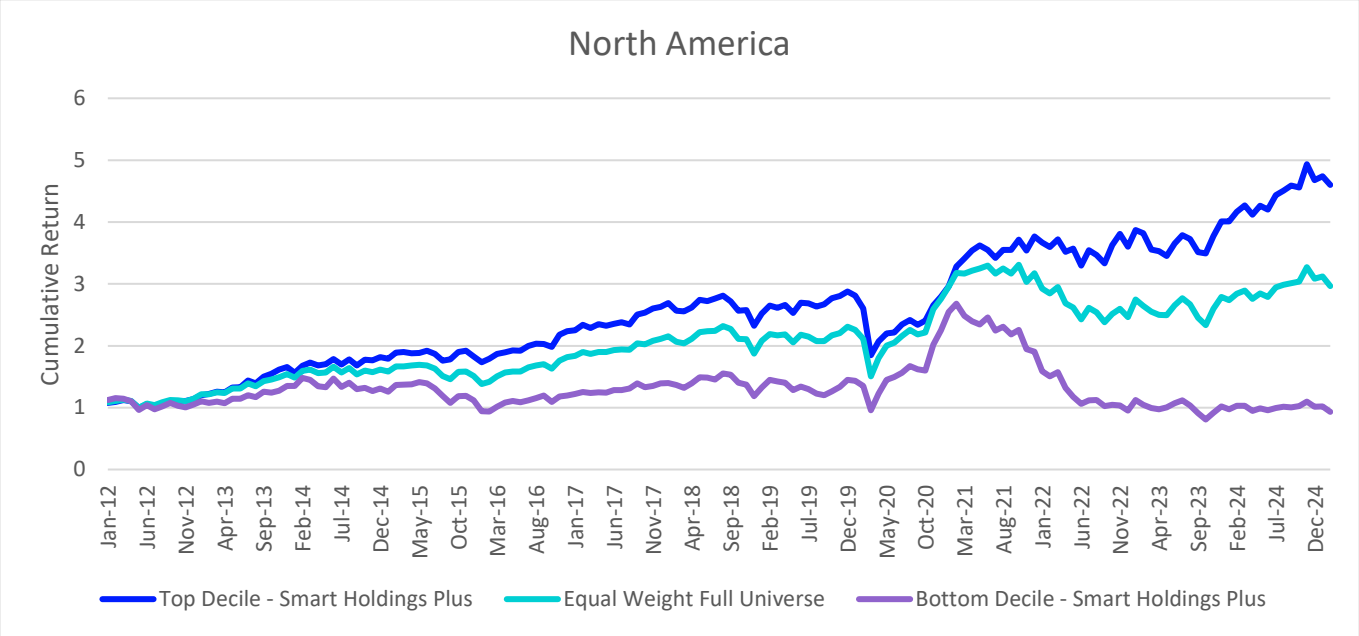


Figure 6b: Smart Holdings Plus Top Decile, Bottom Decile vs. Full Universe Cumulative Returns, North America



In North America, where sustainability investing is less popular compared to Developed Europe, Smart Holdings Plus still shows a slight improvement over the original Smart Holdings model. The multifactor nature of Smart Holdings Plus, along with its adaptive algorithm, demonstrates strong performance across all regional regimes.

Figure 7a: Smart Holdings Plus vs. Original Smart Holdings Cumulative Spread Returns, Developed Asia ex Japan

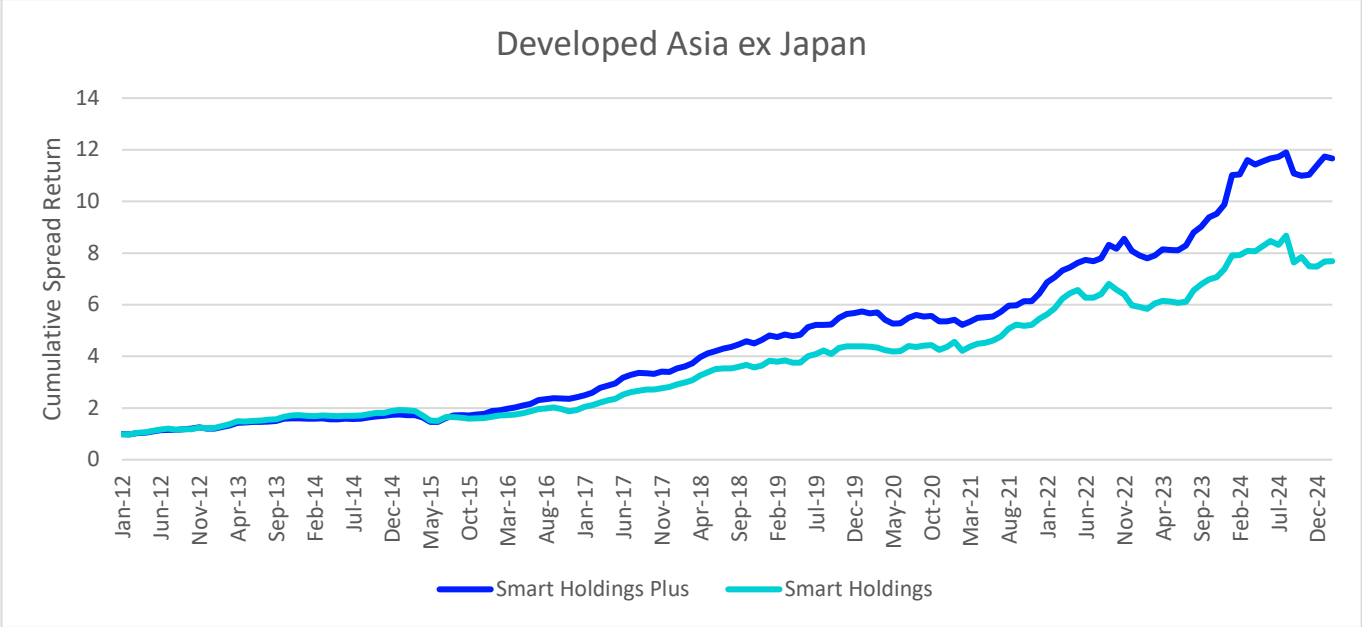
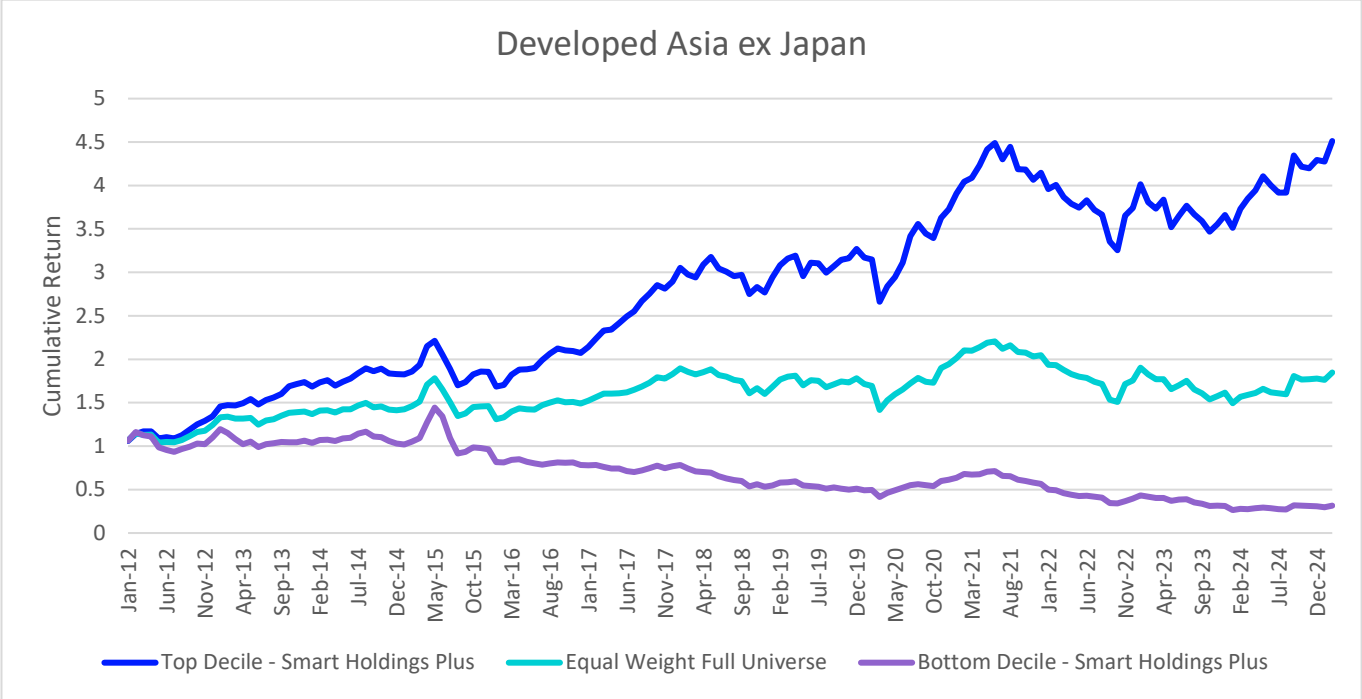


Figure 7b: Smart Holdings Plus Top Decile, Bottom Decile vs. Full Universe Cumulative Returns, Developed Asia ex Japan



Since 2017, ESG factors have played a significant role in Developed Asia. Additionally, Smart Holdings Plus has demonstrated impressive long-only performance compared to the equal-weighted universe.

Figure 8a: Smart Holdings Plus vs. Original Smart Holdings Cumulative Spread Returns, Emerging Markets

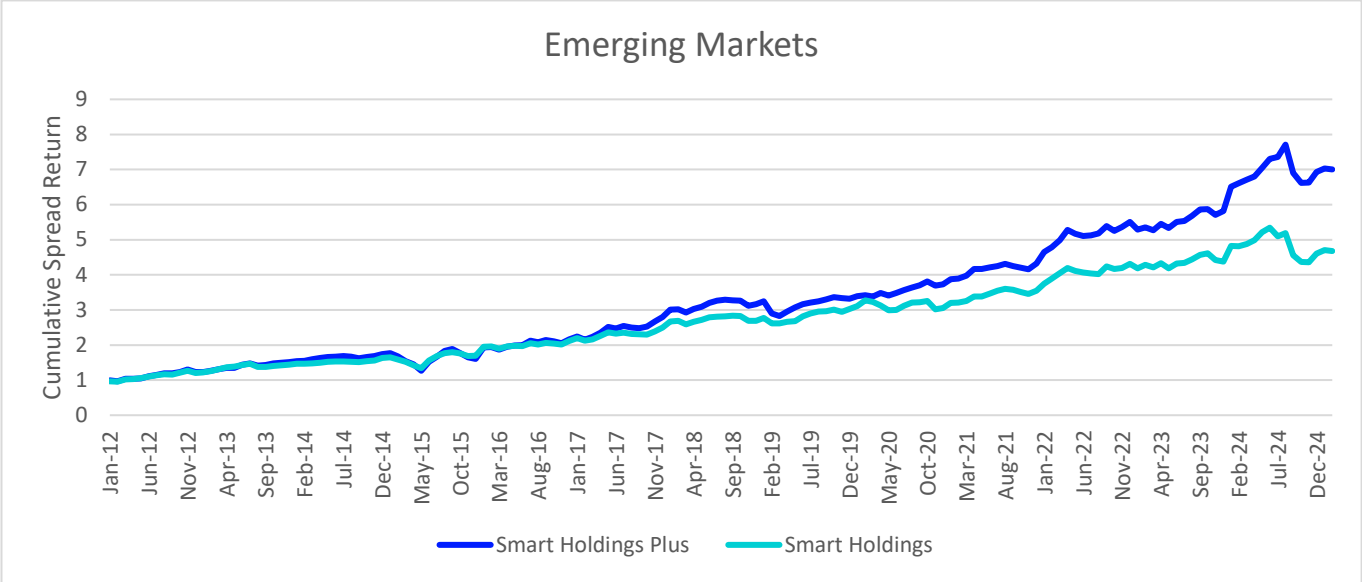
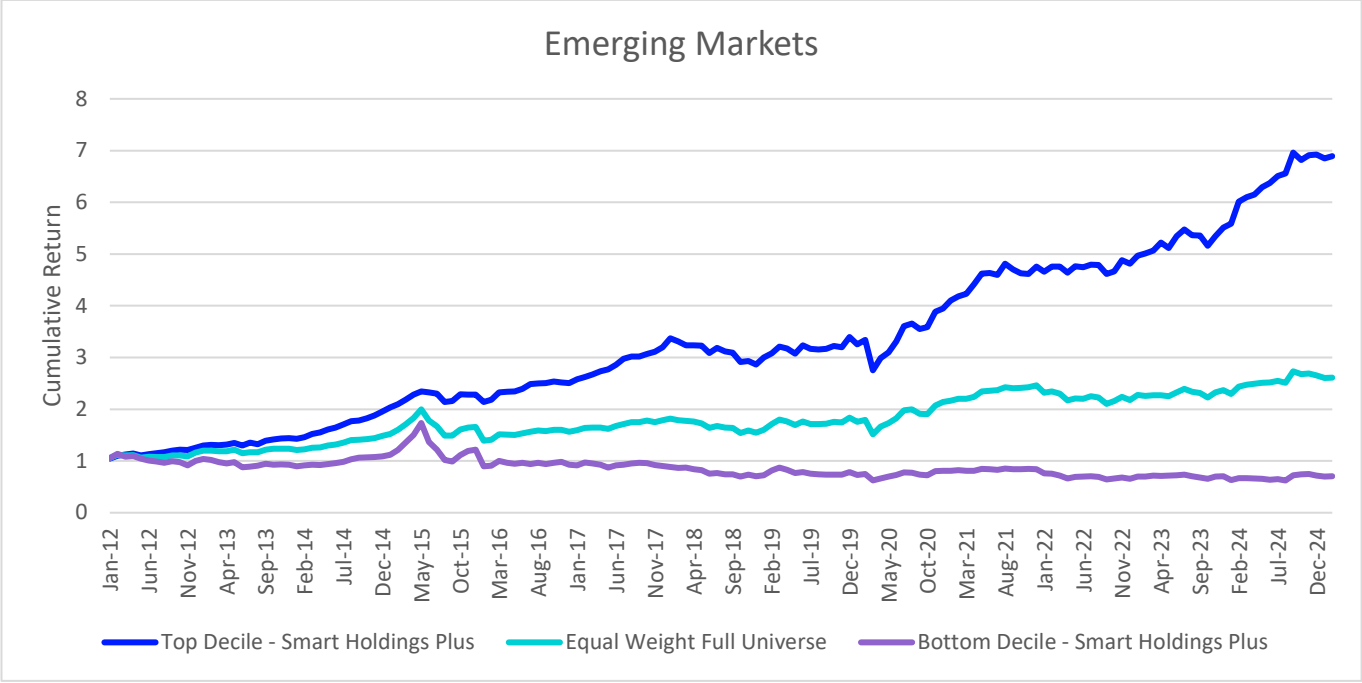


Figure 8b: Smart Holdings Plus Top Decile, Bottom Decile vs. Full Universe Cumulative Returns, Emerging Markets



In Emerging Markets, Smart Holdings Plus, with the inclusion of ESG factors, has provided a significant boost to investments since 2019. The long-only top decile performance of Smart Holdings Plus has also outperformed the relatively flat equal-weighted full universe performance.

Figure 9a: Smart Holdings Plus vs. Original Smart Holdings Cumulative Spread Returns, Japan

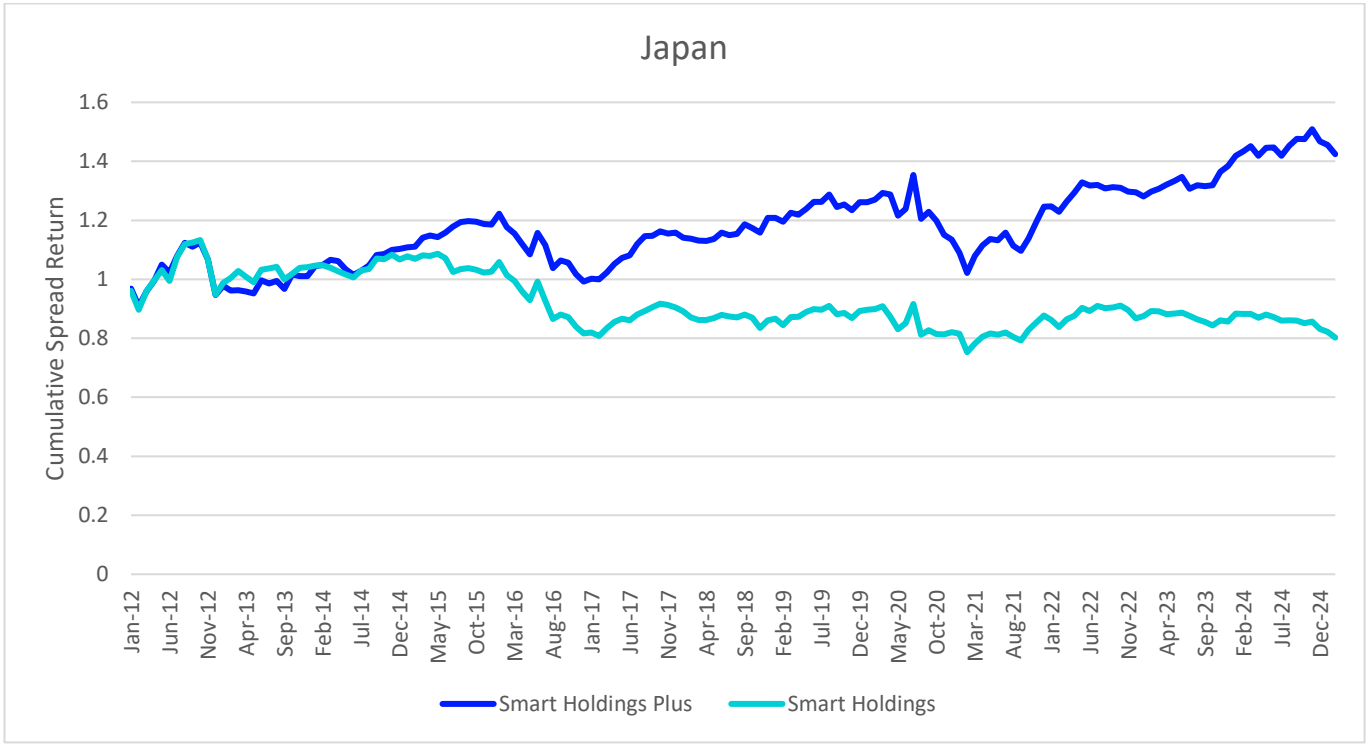
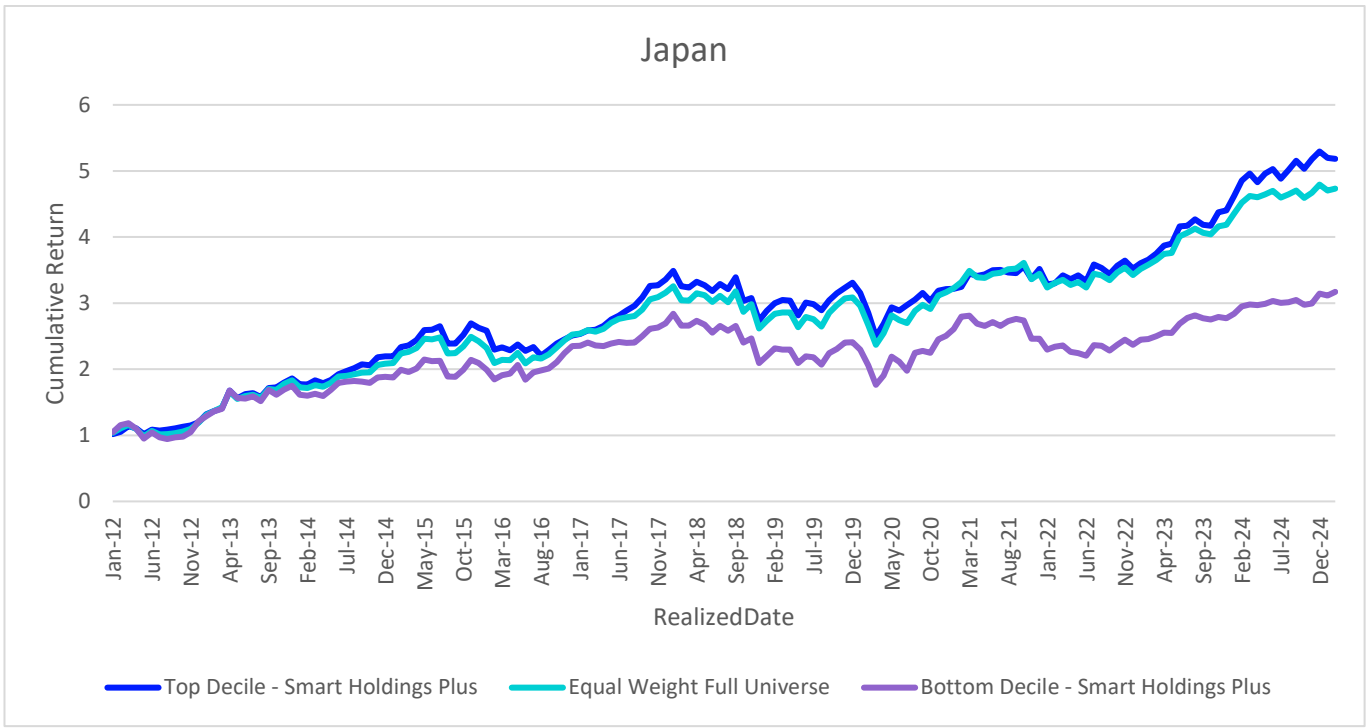


Figure 9b: Smart Holdings Plus Top Decile, Bottom Decile vs. Full Universe Cumulative Returns, Japan



In Japan, the market-neutral spread return of Smart Holdings Plus significantly outperforms the original Smart Holdings model. While the long-only top decile offers only a modest improvement over the equal-weighted full universe, the bottom decile effectively identifies underperforming stocks.

Correlation with other flagship StarMine models

A key consideration for investment decision-making is the orthogonality of the signal being provided by a model to other quant models. The Spearman rank correlation was calculated across all companies in the 2012 - 2024 study window for each existing StarMine alpha models compared to Smart Holdings Plus. As shown in Table 3, we observe low levels of correlation between this and other models - excepting the original Smart Holdings model towards which this behaviour is expected - indicating Smart Holdings Plus can add additional insight to a well-constructed strategy.

Table 5: StarMine Model Ranking Correlation

	Smart Holdings Plus
Smart Holdings Plus	1.00
Intrinsic Valuation	0.17
Relative Valuation	0.35
Analyst Revisions	0.27
Earnings Quality	0.41
Price Momentum	0.26
Smart Holdings	0.85
Short Interest	0.31
Insider	-0.12
Value Momentum	0.48
Combined Alpha	0.55

Conclusion

StarMine Smart Holdings Plus offers a relative ranking of publicly traded companies most likely to attract institutional buying pressure. The model's Screening Component evaluates 24 traditional financial factors and 13 ESG factors to determine which stocks are most likely to pass the screens of active institutional investors. The Change Component ranks stocks based on their recent increase in attractiveness to these investors, highlighting stocks that newly pass a screen and thus garner more attention. Additionally, the model includes a peer adjustment to mitigate overcrowding within a particular peer group.

The original StarMine Smart Holdings remains a unique behavioural finance model, unlike anything else available on the market. StarMine Smart Holdings Plus builds upon this foundation by incorporating sustainable investment motivations, making it the first StarMine model to integrate ESG factors. With global coverage, the model employs a broad multi-factor approach to quantify individual institutional investor preferences.

Performance metrics for StarMine Smart Holdings Plus are impressive, with strong decile spread returns across various regions and years, particularly in the recent out-of-sample period. For example, in 2022, the model achieved a 53% decile spread return globally, demonstrating its ability to adapt to the growing importance of ESG factors. Developed Europe, often viewed as a leader in sustainability investing, saw the highest Decile Spread Return in 2023 and 2024, further validating the model's contemporary relevance. Even in North America, where sustainability investing is less prevalent, Smart Holdings Plus showed a slight improvement over the original Smart Holdings model.

StarMine Smart Holdings Plus provides daily scores for over 49,000 global companies and is available via a data feed. Historical testing files are also available for those who wish to backtest the model, offering valuable insights into its performance and potential alpha generation.

Appendix: Smart Holdings Plus Performance

Table A1: Global Smart Holdings Plus Performance

	Decile Spread Return	Top Decile Return	Bottom Decile Return	Avg Information Coefficient	Decile Spread Sharpe Ratio	Max Drawdown	Avg Num Companies
Global	15.2%	15.4%	0.2%	0.040	0.87	-34.9%	9221
2012	16.3%	25.0%	5.6%	0.059	1.42	-2.1%	9078
2013	21.2%	39.2%	14.6%	0.059	2.46	-1.8%	9113
2014	16.5%	16.0%	-1.5%	0.061	1.58	-4.0%	9132
2015	20.8%	14.2%	-7.0%	0.072	1.91	-3.7%	9167
2016	8.8%	11.3%	0.0%	0.012	0.72	-5.1%	9179
2017	17.6%	30.1%	10.5%	0.069	3.20	-0.7%	9178
2018	8.9%	-9.7%	-17.8%	0.021	1.09	-4.4%	9200
2019	4.1%	21.3%	15.4%	0.039	0.59	-4.4%	9204
2020	-27.5%	4.6%	32.3%	-0.011	-1.38	-31.9%	9220
2021	31.3%	24.2%	-6.9%	0.091	2.34	-2.5%	9253
2022	53.4%	-5.3%	-40.5%	0.057	3.73	-1.0%	9353
2023	7.3%	10.9%	0.2%	0.077	0.52	-7.8%	9405
2024	19.0%	18.0%	-1.9%	0.048	1.79	-3.4%	9428
Energy	23.5%	13.1%	-9.1%	0.054	1.47	-64.8%	533
Basic Materials	16.3%	14.2%	-2.8%	0.039	0.65	-26.7%	784
Industrials	20.6%	18.3%	-2.9%	0.043	1.16	-22.6%	1477
Consumer Cyclicals	15.2%	13.7%	-1.7%	0.027	0.41	-28.7%	1340
Consumer Non-Cyclicals	18.3%	13.9%	-1.7%	0.039	1.36	-44.2%	649
Financials	15.3%	16.4%	1.3%	0.027	0.59	-9.6%	1826
Healthcare	4.1%	14.4%	8.0%	0.037	0.42	-51.5%	841
Technology	13.7%	20.0%	8.7%	0.045	0.91	-45.9%	1069
Utilities	12.3%	13.8%	5.6%	0.032	0.75	-60.7%	310
Real Estate	7.9%	-0.4%	-6.5%	0.007	0.12	-21.7%	727

Table A2: Developed Asia ex Japan Smart Holdings Plus Performance

	Decile Spread Return	Top Decile Return	Bottom Decile Return	Avg Information Coefficient	Decile Spread Sharpe Ratio	Max Drawdown	Avg Num Companies
Developed Asia ex Japan	21.3%	12.8%	-7.6%	0.049	1.03	-16.7%	982
2012	21.0%	34.4%	9.8%	0.077	2.10	-3.3%	973
2013	32.1%	29.3%	-3.1%	0.078	3.04	-0.4%	977
2014	8.5%	5.4%	-3.1%	0.057	1.60	-2.2%	976
2015	2.4%	1.4%	-6.4%	0.045	0.21	-16.7%	973
2016	35.9%	11.6%	-19.0%	0.064	3.89	-1.1%	973
2017	41.0%	39.6%	-1.7%	0.100	3.91	-1.2%	975
2018	36.3%	-4.3%	-30.6%	0.066	5.06	-1.7%	980
2019	22.5%	18.0%	-4.0%	0.063	2.60	-1.3%	985
2020	-5.8%	14.0%	19.8%	0.014	-0.65	-8.2%	986
2021	20.1%	11.3%	-8.0%	0.054	2.39	-3.7%	989
2022	25.6%	-9.8%	-29.9%	0.036	1.94	-5.6%	993
2023	22.3%	-2.1%	-20.9%	0.093	2.47	-1.5%	996
2024	15.3%	17.3%	-1.4%	0.040	1.03	-7.6%	993
Energy	57.0%	23.2%	-26.5%	0.092	1.44	-45.2%	38
Basic Materials	11.6%	11.3%	-2.3%	0.034	0.74	-58.0%	91
Industrials	18.9%	13.5%	-5.7%	0.048	1.08	-28.2%	123
Consumer Cyclicals	24.1%	14.6%	-8.7%	0.055	0.87	-34.6%	160
Consumer Non-Cyclicals	21.0%	9.2%	-8.1%	0.045	0.77	-60.7%	77
Financials	24.5%	20.1%	-4.9%	0.049	0.59	-39.1%	234
Healthcare	12.5%	14.2%	-1.8%	0.077	1.28	-69.4%	67
Technology	26.6%	17.0%	-3.4%	0.060	0.82	-58.9%	69
Utilities	14.8%	12.1%	-7.8%	0.006	0.11	0.0%	46
Real Estate	11.1%	-13.9%	-22.3%	-0.010	-0.17	-12.7%	172

Table A3: Developed Europe Smart Holdings Plus Performance

	Decile Spread Return	Top Decile Return	Bottom Decile Return	Avg Information Coefficient	Decile Spread Sharpe Ratio	Max Drawdown	Avg Num Companies
Developed Europe	21.7%	17.2%	-3.7%	0.061	1.69	-19.4%	2507
2012	20.8%	24.9%	1.8%	0.093	1.97	-1.3%	2477
2013	39.0%	50.1%	7.7%	0.109	5.37	-0.5%	2481
2014	28.2%	13.5%	-11.9%	0.084	4.63	0.0%	2480
2015	29.8%	24.6%	-4.6%	0.087	3.75	-2.1%	2490
2016	9.3%	13.6%	3.4%	0.031	1.56	-2.6%	2496
2017	22.4%	29.9%	6.2%	0.065	6.40	0.0%	2498
2018	12.8%	-8.4%	-19.3%	0.046	3.09	-0.7%	2500
2019	15.7%	29.4%	11.8%	0.061	3.85	-1.0%	2509
2020	-15.8%	3.2%	17.3%	0.019	-0.96	-18.6%	2529
2021	26.4%	29.7%	2.6%	0.090	3.44	-1.9%	2521
2022	40.9%	-11.2%	-38.3%	0.055	4.46	-1.2%	2530
2023	25.7%	10.8%	-12.9%	0.078	2.89	-3.4%	2542
2024	26.9%	12.9%	-11.8%	0.071	3.22	-1.1%	2545
Energy	33.2%	18.9%	-5.5%	0.068	1.30	-52.7%	126
Basic Materials	26.4%	14.9%	-9.4%	0.063	0.76	-24.7%	188
Industrials	27.7%	20.1%	-6.1%	0.053	1.13	-24.6%	488
Consumer Cyclicals	17.2%	14.7%	-1.8%	0.049	1.01	-24.7%	395
Consumer Non-Cyclicals	21.9%	18.6%	-0.8%	0.057	1.53	-38.4%	175
Financials	16.0%	17.0%	0.5%	0.044	1.00	-11.4%	485
Healthcare	13.6%	13.8%	0.0%	0.080	1.24	-23.5%	195
Technology	20.3%	19.0%	2.9%	0.069	1.54	-40.3%	271
Utilities	11.2%	13.1%	5.8%	0.056	0.88	-61.3%	74
Real Estate	19.7%	8.7%	-8.3%	0.037	0.73	-13.1%	213

Table A4: Emerging Markets Smart Holdings Plus Performance

	Decile Spread Return	Top Decile Return	Bottom Decile Return	Avg Information Coefficient	Decile Spread Sharpe Ratio	Max Drawdown	Avg Num Companies
Emerging Markets	16.6%	16.6%	-1.6%	0.049	1.58	-28.5%	1485
2012	23.2%	25.8%	0.1%	0.069	1.66	-5.5%	1473
2013	22.7%	14.8%	-7.5%	0.069	2.26	-4.3%	1476
2014	15.0%	35.4%	17.7%	0.046	2.57	-3.4%	1478
2015	-7.7%	16.6%	11.6%	0.033	-0.10	-28.5%	1487
2016	34.5%	10.0%	-23.8%	0.063	1.44	-4.3%	1485
2017	29.5%	27.7%	-2.7%	0.106	2.22	-3.9%	1483
2018	13.1%	-10.5%	-21.6%	0.028	1.20	-5.2%	1485
2019	4.7%	18.5%	10.8%	0.028	0.39	-13.1%	1486
2020	12.5%	16.3%	3.2%	0.030	1.72	-3.2%	1487
2021	16.0%	20.6%	4.0%	0.050	2.08	-3.6%	1488
2022	27.2%	1.1%	-22.1%	0.032	2.31	-3.2%	1491
2023	5.7%	14.6%	7.7%	0.093	0.67	-2.8%	1494
2024	19.2%	25.6%	1.8%	0.051	1.04	-14.1%	1494
Energy	9.8%	12.3%	4.0%	0.044	0.85	-72.0%	95
Basic Materials	11.8%	14.6%	1.7%	0.043	0.90	-45.7%	191
Industrials	21.8%	20.7%	-3.6%	0.057	2.22	-24.4%	199
Consumer Cyclicals	10.4%	13.5%	-0.4%	0.044	1.10	-35.9%	151
Consumer Non-Cyclicals	5.7%	15.2%	8.3%	0.045	1.05	-58.5%	139
Financials	11.7%	16.7%	4.5%	0.046	0.85	-27.7%	324
Healthcare	2.7%	7.6%	4.8%	0.023	0.40	-69.5%	94
Technology	14.1%	19.9%	4.1%	0.053	0.95	-62.2%	158
Utilities	4.0%	12.4%	6.4%	0.040	0.76	-64.5%	81
Real Estate	15.0%	26.3%	6.4%	0.073	1.39	-32.0%	40

Table A5: Japan Smart Holdings Plus Performance

	Decile Spread Return	Top Decile Return	Bottom Decile Return	Avg Information Coefficient	Decile Spread Sharpe Ratio	Max Drawdown	Avg Num Companies
Japan	3.4%	15.1%	10.2%	-0.002	-0.03	-24.5%	986
2012	-5.3%	19.8%	21.0%	0.007	-0.20	-15.8%	974
2013	6.7%	55.1%	44.6%	0.040	0.80	-2.9%	976
2014	9.1%	18.0%	7.7%	0.020	1.41	-4.8%	984
2015	7.5%	19.8%	11.1%	0.027	2.11	-1.0%	985
2016	-16.3%	-4.5%	12.3%	-0.041	-1.30	-18.8%	986
2017	16.7%	33.9%	14.7%	0.050	3.51	-0.7%	986
2018	4.2%	-18.5%	-22.4%	-0.017	0.70	-2.4%	985
2019	4.4%	20.8%	15.0%	0.037	0.73	-4.1%	985
2020	-10.1%	-2.9%	4.2%	-0.013	-0.54	-16.2%	985
2021	9.9%	9.5%	-1.8%	0.018	0.75	-6.3%	989
2022	3.9%	0.1%	-3.8%	0.011	0.78	-2.5%	993
2023	6.9%	25.1%	17.0%	0.025	1.28	-2.9%	997
2024	6.0%	20.2%	13.4%	0.018	0.92	-2.8%	998
Energy	7.4%	6.9%	-1.2%	-0.025	-0.15	0.0%	12
Basic Materials	-4.0%	10.4%	13.3%	0.009	0.22	-71.4%	93
Industrials	0.4%	15.9%	13.8%	-0.007	-0.14	-58.6%	240
Consumer Cyclicals	-1.5%	13.5%	14.1%	-0.031	-0.30	-47.4%	197
Consumer Non-Cyclicals	6.1%	18.0%	10.4%	0.008	0.21	-33.6%	101
Financials	6.2%	20.5%	13.1%	0.010	0.16	-48.1%	129
Healthcare	8.2%	9.1%	-2.8%	0.039	0.53	-57.4%	57
Technology	4.6%	19.4%	8.4%	0.020	0.24	-57.0%	110
Utilities	1.5%	13.9%	12.6%	0.053	0.50	-84.9%	18
Real Estate	11.8%	13.8%	-0.1%	0.014	0.25	-14.5%	72

Table A6: North America Smart Holdings Plus Performance

	Decile Spread Return	Top Decile Return	Bottom Decile Return	Avg Information Coefficient	Decile Spread Sharpe Ratio	Max Drawdown	Avg Num Companies
North America	12.3%	13.6%	3.3%	0.036	0.65	-53.9%	3261
2012	6.4%	13.9%	5.0%	0.029	0.65	-2.3%	3181
2013	13.2%	45.6%	28.5%	0.032	1.81	-3.1%	3203
2014	10.6%	9.7%	-2.8%	0.062	0.81	-5.9%	3214
2015	14.8%	0.4%	-14.7%	0.069	1.07	-6.8%	3232
2016	11.0%	22.6%	7.0%	0.004	0.73	-11.9%	3238
2017	0.7%	17.4%	16.2%	0.043	0.12	-5.1%	3236
2018	2.1%	-11.5%	-14.8%	0.005	0.25	-9.1%	3249
2019	-1.2%	23.8%	22.4%	0.033	-0.03	-11.6%	3240
2020	-43.9%	-2.9%	55.0%	-0.036	-2.31	-43.2%	3234
2021	52.9%	34.9%	-15.4%	0.145	2.25	-6.8%	3266
2022	78.7%	-4.4%	-49.9%	0.083	3.42	-2.7%	3347
2023	-1.6%	11.4%	6.6%	0.072	0.02	-9.7%	3376
2024	15.6%	16.7%	0.0%	0.054	1.85	-2.9%	3398
Energy	12.6%	7.4%	-8.8%	0.040	1.10	-89.5%	262
Basic Materials	25.4%	16.8%	-5.4%	0.037	0.61	-44.2%	222
Industrials	18.8%	17.3%	0.2%	0.035	0.68	-55.3%	427
Consumer Cyclicals	14.7%	14.2%	2.0%	0.022	0.28	-44.0%	436
Consumer Non-Cyclicals	25.4%	7.9%	-10.5%	0.040	1.00	-58.9%	156
Financials	19.2%	13.8%	-1.7%	0.009	0.15	-28.7%	653
Healthcare	0.2%	15.6%	13.5%	0.019	0.22	-64.7%	428
Technology	10.6%	15.8%	10.7%	0.039	0.74	-65.0%	462
Utilities	4.4%	11.3%	9.4%	0.005	0.07	-97.5%	92
Real Estate	7.9%	2.1%	-4.7%	0.003	0.07	-36.4%	228

References

Sargent, D. and Renick, D., 2011. LSEG StarMine Smart Holdings Model, StarMine white paper.