LOMBARD ODIER
INVESTMENT MANAGERS

Investment viewpoint

ESG alpha: doing well while doing good

For professional investor use only

February 2020

Alexey Medvedev
Quantitative Portfolio Manager

Laurent Joue
Senior Portfolio Manager

Portfolio managers integrate ESG criteria for a number of different reasons. One of them is the desire to do "good," which is a part of the global trend towards more responsible investment. Another reason for ESG integration is better risk management. ESG data can provide an alternative view on companies, which may help detect risks not evident from fundamental or market data. Lastly, more and more portfolio managers use ESG as an additional source of alpha hoping that ESG issues are not yet priced by the market.

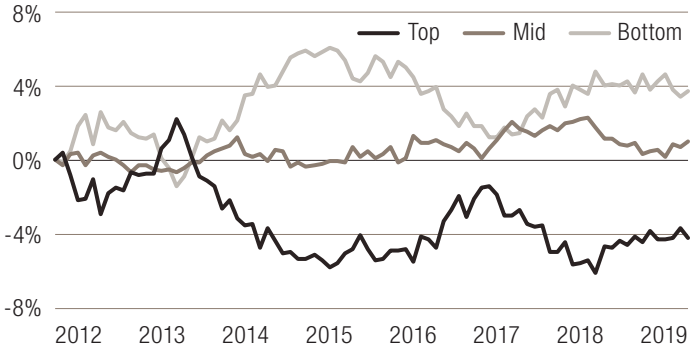
The search for ESG alpha is complicated by the divergence of ESG methodologies. The main challenge of ESG integration is to transform a largely qualitative assessment of ESG issues into a quantitative measure to be used for stock picking. As each data provider follows its proprietary methodology, the resulting ESG-based rankings of stocks often differ substantially. Berg et al. (2019)[1] report that the correlation of scores between different data providers can be as low as 0.4. Unsurprisingly, the divergence is explained largely by different approaches to quantifying ESG criteria.

Friede (2015[2]) did an extensive review of empirical literature concluding that the majority of studies find a positive relationship between ESG and financial performance of companies. As good as it sounds, we believe we need to be cautious before drawing out far reaching conclusions, due to the tendency of positive results being published more often than negative ones. In fact, the most recent study of Breedt at al. (2019)[3] finds no evidence of alpha when using MSCI ESG scoring. If anything, the performance of ESG is explained primarily by a large cap bias.

Here, we have done our homework on ESG alpha, and present our main findings in this paper. We start with a study of predictive power of a generic ESG score, and then demonstrate how quantitative techniques can help in enhancing ESG alpha. In the last section, we discuss implementing ESG in real-life portfolios.

[1] Berg et al. (2019): Table 2 on page 7.
[2] Friede (2015): Figure 2 on page 217.
[3] Breedt at al. (2019). Figures 4 and 5 on page 38.

EX. 1 GLOBAL PERFORMANCE OF ESG



Source: LOIM, Sustainalytics. For illustrative purposes only.

First experiment

Throughout this paper, we will use raw ESG data provided by Sustainalytics,[4] which consists of over 130 key performance indicators (KPIs). Each KPI is represented by a quantitative score ranging from 0 (poor) to 100 (good).

We start with a simple test of predictability of stock returns based on their ESG scores. For this purpose, we built a generic ESG score by simply averaging all the KPIs.[5] At the end of each month, from December 2012 to November 2019, we grouped stocks in the MSCI World index[6] into three buckets according to the ESG score (top, mid and bottom), and computed the average performance within those buckets one month ahead. Exhibit 1 shows the relative performance of top, mid and bottom ESG stocks.

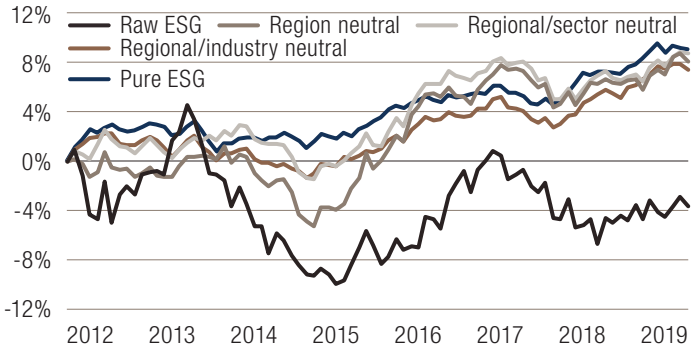
The first results are clearly disappointing. We do not observe any signs of ESG alpha. On the contrary, over the last two years, bottom ESG stocks did better than average while top ESG stocks were lagging.

Even if ESG alpha exists, we do not observe it to be a dominant factor behind stock returns. Therefore, to uncover it, we believe one must control exposures to systematic factors that may interact with ESG-based stock selection. The most obvious candidate is a regional bias.

If we compare three large regions (US, Europe and Japan), we find that average ESG scores in Europe tend to be consistently higher than in USA and Japan. In particular, the share of US stocks in the top ESG bucket is only 25% while its share within the bottom bucket is as much as 50%.[7] Knowing that US stocks outperformed over the period of observations, it is not surprising that top ESG stocks underperformed. Clearly, we can see that they performed badly for reasons not related to ESG.[8]

Apart from regional biases, one might want to account for sectoral, industry and even factor biases. Exhibit 2 shows the performance of long-short portfolios[9] built from ESG rankings after accounting for various systematic biases. "Raw ESG" is the portfolio formed from the original (raw) ESG score. On the other side of spectrum, is the "Pure ESG" portfolio that is cleaned from all the systematic risks mentioned above.[10] The table below shows characteristics of these portfolios.

EX. 2 "CLEANING" ESG PERFORMANCE



	ORIGINAL SCORE (RAW ESG)	REGION NEUTRAL	REGION/SECTOR NEUTRAL	REGION/INDUSTRY NEUTRAL	REGION/INDUSTRY/ FACTORS NEUTRAL (PURE ESG)
Sharpe ratio	-0.11	0.41	0.55	0.65	0.87
ESG score	29.0	25.0	23.4	18.1	15.0

Source: LOIM, Sustainalytics. For illustrative purposes only.

[4] Sustainalytics is an independent global provider of ESG and corporate governance research and ratings to investors.
[5] We ignored KPIs that are not available for a given company.
[6] The MSCI World Index captures large and mid-cap representation across 23 Developed Markets (DM) countries. With 1,644 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in each country.
[7] Interestingly, the share of US stocks in the bottom ESG group is consistently increasing over time, while the share in the top group is going down.
[8] This statement has taken into account two facts: 1) the top ESG bucket has less US stocks than the bottom ones. 2) US outperformed the rest of the world, and we can conclude that the relative performance of top versus bottom ESG stocks can be explained by the outperformance of US versus other regions. Since the outperformance of US had clearly nothing to do with ESG issues, we can say that top ESG stocks performed badly for reasons not related to ESG.
[9] Portfolio weights are linear functions of the neutralized ESG scores (here neutralized ESG score implies that the ESG score is neutralized to systematic factors i.e. regions, sector, industry and/or factors). Regional and sector neutralization was done in a "hard" way by ranking stocks within those buckets. Industry (GICS4) neutralization was done in a "soft" way by first subtracting industry averages and then ranking by regional-sector buckets. Factor neutralization was performed using a pure factor approach as discussed in our white paper "Our approach to factor investing."
[10] We neutralized ESG score to five factors Value, Quality, Momentum, Low Beta, and Small Size.

Regional biases indeed play an important role in explaining the performance of ESG. Indeed, the region-neutral portfolio ends up with a positive total return over the period of observations. Further neutralizing the ESG score to sectors, industries and, ultimately, factors allows achieving progressively smoother performance without impacting the final result.

Factor biases are important to control as ESG scores interact with some of them, most notably, with the Small Size factor. Indeed, since KPIs are based on self-reporting data, large companies tend to look better as they have more resources to report to data providers than small companies. As a consequence, ESG integration generates a large-cap bias in portfolios.

The performance of the "Pure ESG" portfolio provides a first evidence of positive ESG alpha. The Sharpe ratio of the strategy is 0.87 over the full period and 1.06 since 2015. Of course, investing in a "Pure ESG" portfolio comes at "costs." As shown in Exhibit 2, building a portfolio with a "purified" score ultimately results in a lower overall ESG score,[11] which might not always be desirable. For example, if the only objective of the investor is to enhance an ESG profile of the portfolio than "Raw ESG" might be a better candidate. However, majority of investors, including us, face a dual objective of achieving better performance (doing well) and also improving their ESG score (doing good). From this point of view, "Pure ESG" seems to be the most attractive option.

Putting machine at work

We found evidence of positive ESG alpha using a generic ESG score, which is a simple average of different KPIs. A natural step forward is to try to be more selective in weighting KPIs. This can be achieved using two approaches. The first one is to make a qualitative assessment of the issues that are material for companies, and use only those when forming the aggregate ESG score. Henriksson et al. (2019) find that using material scores improves the performance of "good" relative to "bad" ESG companies. The second approach – a pure quantitative one – is to detect issues that have performance implications based on historical data, and build the quantitative ESG score accordingly. Below, we will focus on this quantitative approach. To distinguish the quantitative ESG score from the generic one discussed in the previous section, we will refer to it as ESG-QUANT score.

Quantitative ESG scoring is a natural application of machine learning (ML) techniques. We expect the "machine" to "learn" a predictive relationship between KPIs and stock returns. Power of ML is in its ability to run through large amounts of data and find relationships not visible through lenses of simple analytical tools. However, with power comes great responsibility. ML could clearly overfit data by finding predictive relationships that worked in the past, but that will not hold once the strategy goes live. To avoid such scenarios, it is a common practice to validate the learning process by checking how well it works "out-of-sample." However, given a short history of ESG data and the evolution of the market attitude towards ESG issues, it is a challenging task.

In choosing ML methodology, we must also keep in mind that our objective is not only to do well but also to do good. This means that ESG-based KPIs must have either positive or no effect on the ESG-QUANT score. In fact, we would not even have the right to call it an "ESG score" otherwise. We have observed that the majority of ML models are literally "black boxes" where such constraints are extremely difficult to implement. This is the main reason why we decided to restrict ourselves to linear models, to ensure the full transparency of the effect of each KPI on the model prediction.

As we have mentioned above, certain ESG issues may be material for some sectors but not for the others. This is why we decided to build individual models for each sector[12] in each of the three large regions (USA, Europe and Japan). In a nutshell, a sectoral model attempts to predict the probability that a stock outperforms its peers over forthcoming months as a linear function of its KPIs.

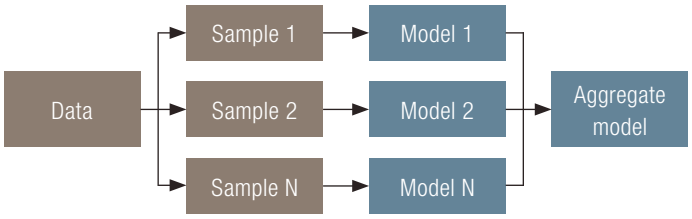
$$\text{Probability} = a + b_1\text{KPI}_1 + \cdots + b_n\text{KPI}_n + \text{Residual}$$

To make sure that we are indeed "doing good," model coefficients are constrained to be non-negative ($b_i \geq 0$).

Following our analysis of systematic risks, we decided to "purify" KPIs from industry biases. This measure also reduces the likelihood of overfitting to short-life trends. Indeed, as we estimate the predictive model over a relatively short period of time,[13] divergence in industry performances might be captured by the model if KPIs have industry biases. Understandably, we do not want this to happen. We expect our model to capture the predictive effect of ESG and not industry momentum.

As the model is estimated on a limited dataset, this result might not be very stable or, as we say, "noisy." To reduce this noise, we apply a methodology called "bootstrap aggregation" or "bagging," which is a common tool in machine learning. It works as follows: instead of estimating a single model, we fit a large number of models (several thousands) on alternative datasets that are obtained by re-sampling the initial one. Furthermore, to enhance "randomness," for each estimation we use only a subset of KPIs.[15] After all the models are estimated, we aggregate them into a single one, which is also linear. The bagging technique is illustrated in Exhibit 3.

EX. 3 ILLUSTRATION OF BOOTSTRAP AGGREGATION



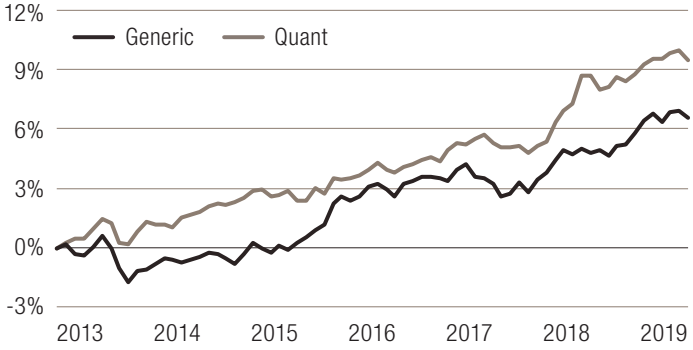
Source: LOIM. For illustrative purposes only.

[11] ESG score of a long-short portfolio is equal to ESG score of the long leg minus ESG score of the short leg. Therefore a positive score means that the portfolio has a positive ESG profile.
[12] Sectors are defined by GICS classification.
[13] We use a rolling window of 3 years to capture the most recent trends in ESG.
[14] The most scientific way is to use a logit regression. We do not see a need to do this as linear probability model is different from logit regressions only if probabilities are close to zero or unity. We do not expect our prediction model to be that powerful.
[15] To be precise, we randomly select one third of KPIs for each model estimation, which is a typical default choice, for example, in Random forest classification.

Once the prediction model is estimated, the ESG-QUANT score is computed as follows: current levels of KPIs are substituted into the model[16] and then stocks are ranked within each sector according to the estimated probability of outperformance.

Exhibit 4 shows the performance of a long-short portfolio built from the ESG-QUANT score "purified" from exposures to five factors. The performance of this portfolio is compared to the performance of a "generic" one which was built from an equal-weight version of the ESG score. In this example, the quant portfolio produced greater absolute and risk adjusted performance, while achieving a positive ESG profile.

EX. 4 BACK-TEST OF QUANTITATIVE ESG PORTFOLIO



	GENERIC ESG	ESG-QUANT
Sharpe ratio	0.80	1.23
ESG score	14.1	10.1

Source: LOIM. For illustrative purposes only. This material contains hypothetical (simulated) backtested performance results and other related information ("Hypothetical Results"). The period shown for the Hypothetical Results is based on available information and LOIM believes the period to be representative and statistically valid. Changes in the assumptions would have a material impact on the Hypothetical Results and other statistical information based on the Hypothetical Results. Past performance is not indicative of future results.

ESG factor in long-only portfolios

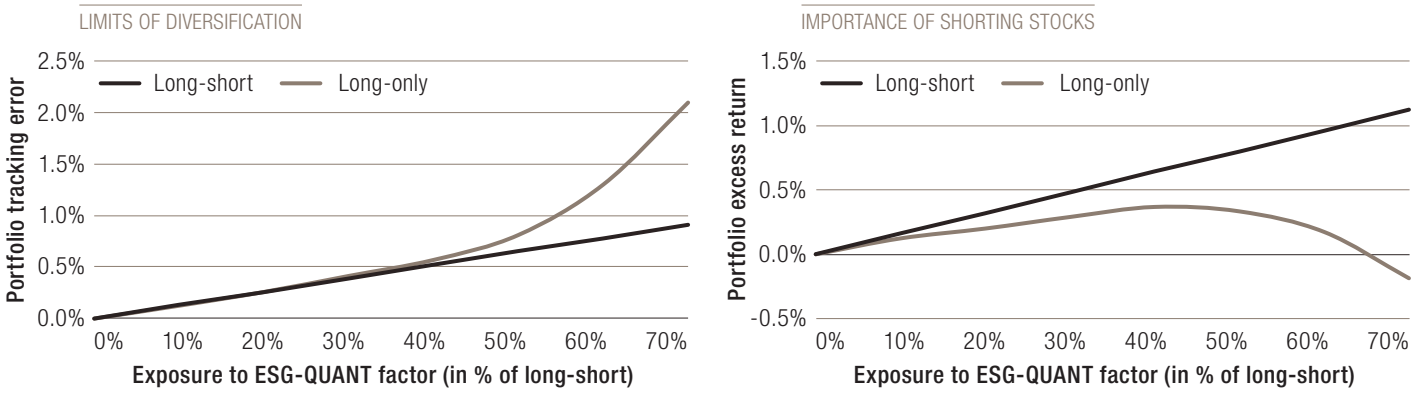
Thus far we studied ESG investing in long-short portfolios. Now it is time to see if we can replicate the same behavior in long-only portfolios. It is convenient to interpret the long-only portfolio as a long-short portfolio with an additional constraint. This constraint being that stock weights in the short leg do not exceed their weights in some benchmark. Building a portfolio with material ESG tilt will make this constraint binding for a larger number of stocks, which can have adverse implications on the performance.

In a long-short portfolio implementing a given factor (be it ESG-QUANT factor or any other), factor exposures are generated both on the long side (as we overweight "good" stocks) and on the short side (as we underweight "bad" ones). With the short side being constrained, long-only portfolios do not have the same capacity to generate exposures to the factor. Furthermore, if the factor premia originates mainly from shorting stocks, then long-only portfolios will not yield as much alpha as we may expect.

Exhibit 5 shows the limitations of long-only constraints when implementing the ESG-QUANT factor. We built several portfolios where we targeted exposures to the ESG-QUANT factor equal to a fraction of its exposure in the optimal long-short portfolio.[17] The left graph shows how the portfolio ex-post tracking error depends on its factor exposure. This relationship forms a straight line when long-only constraints are not binding, which is the case of long-short portfolios. Indeed, a higher factor exposure is translated into a proportionate increase in the tracking error. The relationship for long-only portfolios follows the same path up to an exposure of around 40%, and then starts quickly deviating. The gap between the two curves reflects the magnitude of the contribution of the idiosyncratic risk.

This observation is somewhat disappointing, as it suggests that it is difficult to implement ESG on a standalone basis. Indeed, the exposure of 40% corresponds to about 0.6% tracking error, which is low by any means. Of course, it does mean that we should leave the alpha on the table. ESG-QUANT factor can be still implemented as a part of multi-factor strategy. It is important to keep in mind that within a multi-factor portfolio, single factors are less impacted by long-only constraints as those constraints are applied on the whole portfolio and not on a single factor level.

EX. 5 REPLICATING ESG-QUANT FACTOR IN LONG-ONLY PORTFOLIOS



Source: LOIM. For illustrative purposes only. This material contains hypothetical (simulated) backtested performance results and other related information ("Hypothetical Results"). The period shown for the Hypothetical Results is based on available information and LOIM believes the period to be representative and statistically valid. Changes in the assumptions would have a material impact on the Hypothetical Results and other statistical information based on the Hypothetical Results. Past performance is not indicative of future results.

[16] We ignore the factor part as our objective is to make predictions only on the basis of ESG data.

[17] Each long-only portfolio achieves the target factor exposure with the minimum dispersion of active weights under long-only constraints. In the absence of long-only constraints, portfolio weights are a linear transformation of exposures to the ESG factor.

The second graph in Exhibit 5 shows the impact of an ESG-QUANT factor tilt on the excess return. In the unconstrained (long-short) case, the relationship is again depicted by a straight line. Excess returns of long-only portfolios start falling behind very quickly even at exposures below 40%. This loss of alpha is explained by the inability of long-only portfolios to take full advantage of shorting stocks, which seems to be an important source of ESG alpha.

To conclude our analysis, Exhibit 6 reports back-test results of long-only portfolios implementing the ESG-QUANT factor and the generic (equal-weighted) one. Each portfolio targets 40% of the long-short exposure at each rebalancing date. The portfolio turnover was optimized[18] by taking into account transaction costs of 0.05%. We note that both strategies benefit from a material turnover, which evidences the importance of ESG momentum.

EX. 6 BACK-TEST OF LONG-ONLY ESG PORTFOLIOS

	ESG-QUANT	GENERIC ESG
Excess return	0.34%	0.24%
Tracking error	0.57%	0.65%
Information ratio	0.43	0.27
Turnover	210%	145%

Source: LOIM. For illustrative purposes only. Performance of monthly rebalanced portfolios net of transaction costs from January 2013 to November 2019. This material contains hypothetical (simulated) backtested performance results and other related information ("Hypothetical Results"). The period shown for the Hypothetical Results is based on available information and LOIM believes the period to be representative and statistically valid. Changes in the assumptions would have a material impact on the Hypothetical Results and other statistical information based on the Hypothetical Results. Past performance is not indicative of future results.

Conclusion

The main take-away of the paper is that ESG alpha exists, however, it is not easy to take advantage of in real-life portfolios.

ESG investing in a standalone long-only portfolio does not seem to be attractive, at least not yet. We have observed that acceptable results can be achieved only for low tracking error portfolios, which puts it in tough competition with index ETFs. Nevertheless, in our view, ESG-QUANT factor can still be implemented in multi-factor portfolios serving as an additional source of alpha and improving the ESG profile of portfolio

We noted that an important part of ESG premia comes from shorting stocks. This implies that ESG premia is better harvested in long-short portfolios, where it can be implemented on a standalone basis. We are currently working on a long-short strategy that is based on the application of machine learning techniques to both ESG and fundamental data.

References

Berg F., J.F. Koelbel, and R. Rigobon, 2019, Aggregate Confusion: The Divergence of ESG ratings, MIT Sloan School Working Paper, 5822-19

Breedt A., S. Cilliberti, S. Gualdi and P. Seager, 2019, Is ESG and Equity Factor or Just an Investment Guide, *The Journal of Investing*, Special issue, No 28(2), pp. 32-42.

Friede G., T. Busch and A. Bassen, 2015, ESG and Financial Performance: Aggregated Evidence From More Than 2000 Empirical Studies, *Journal of Sustainable Finance and Investment* 5:4, pp. 210-233.

Henriksson R., J. Livnat, P. Pfeifer, and M. Stumpp, 2019, Integrating ESG in Portfolio Construction, *the Journal of Portfolio Management*, Vol. 45(4), pp. 67-81

LOIM, 2020, Our Approach to Factor Investing, *White paper.*

[18] We modified the objective of portfolio optimization (dispersion of active weights) to include a penalty on turnover. The penalty parameter was then calibrated on ex-post basis.

IMPORTANT INFORMATION

For professional investor use only.

This document is issued by Lombard Odier Funds (Europe) S.A. a Luxembourg based public limited company (SA), having its registered office at 291, route d'Arlon, 1150 Luxembourg, Grand Duchy of Luxembourg, authorised and regulated by the CSSF as a Management Company within the meaning of EU Directive 2009/65/EC, as amended; and within the meaning of the EU Directive 2011/61/EU on Alternative Investment Fund Managers (AIFMD). The purpose of the Management Company is the creation, promotion, administration, management and the marketing of Luxembourg and foreign UCITS, alternative investment funds ("AIFs") and other regulated funds, collective investment vehicles or other investment vehicles, as well as the offering of portfolio management and investment advisory services.

This document is provided for informational purposes only and does not constitute an offer or a recommendation to purchase or sell any security or service. It is not intended for distribution, publication, or use in any jurisdiction where such distribution, publication, or use would be unlawful. This document does not contain personalized recommendations or advice and is not intended to substitute any professional advice on investment in financial products. Before entering into any transaction, an investor should consider carefully the suitability of a transaction to his/her particular circumstances and, where necessary, obtain independent professional advice in respect of risks, as well as any legal, regulatory, credit, tax, and accounting consequences. This document is the property of LOIM and is addressed to its recipients exclusively for their personal use. It may not be reproduced (in whole or in part), transmitted, modified, or used for any other purpose without the prior written permission of LOIM. The contents of this document are intended for persons who are sophisticated investment professionals and who are either authorised or regulated to operate in the financial markets or persons who have been vetted by LOIM as having the expertise, experience and knowledge of the investment matters set out in this document and in respect of whom LOIM has received an assurance that they are capable of making their own investment decisions and understanding the risks involved in making investments of the type included in this document or other persons that LOIM has expressly confirmed as being appropriate recipients of this document. If you are not a person falling within the above categories you are kindly asked to either return this document to LOIM or to destroy it and are expressly warned that you must not rely upon its contents or have regard to any of the matters set out in this document in relation to investment matters and must not transmit this document to any other person. This document contains the opinions of LOIM, as at the date of issue. The information and analysis contained herein are based on sources believed to be reliable. However, LOIM does not guarantee the timeliness, accuracy, or completeness of the information contained in this document, nor does it accept any liability for any loss or damage resulting from its use. All information and opinions as well as the prices indicated may change without notice. Neither this document nor any copy thereof may be sent, taken into, or distributed in the United States of America, any of its territories or possessions or areas subject to its jurisdiction, or to or for the benefit of a United States Person. For this purpose, the term "United States Person" shall mean any citizen, national or resident of the United States of America, partnership organized or existing in any state, territory or possession of the United States of America, a corporation organized under the laws of the United States or of any state, territory or possession thereof, or any estate or trust that is subject to United States Federal income tax regardless of the source of its income.

Source of the figures: Unless otherwise stated, figures are prepared by LOIM.

Singapore: This marketing communication has been approved for use by Lombard Odier (Singapore) Ltd for the general information of accredited investors and other persons in accordance with the conditions specified in Sections 275 and 305 of the Securities and Futures Act (Chapter 289). Recipients in Singapore should contact Lombard Odier (Singapore) Ltd, an exempt financial adviser under the Financial Advisers Act (Chapter 110) and a merchant bank regulated and supervised by the Monetary Authority of Singapore, in respect of any matters arising from, or in connection with this marketing communication. The recipients of this marketing communication represent and warrant that they are accredited investors and other persons as defined in the Securities and Futures Act (Chapter 289). This advertisement has not been reviewed by the Monetary Authority of Singapore.

Hong Kong: This marketing communication has been approved for use by Lombard Odier (Hong Kong) Limited, a licensed entity regulated and supervised by the Securities and Futures Commission in Hong Kong for the general information of professional investors and other persons in accordance with the Securities and Futures Ordinance (Chapter 571) of the laws of Hong Kong.

Important information on benchmarks

Any benchmarks/indices cited herein are provided for information purposes only. No benchmark/index is directly comparable to the investment objectives, strategy or universe of a fund. The performance of a benchmark shall not be indicative of past or future performance of any fund. It should not be assumed that the relevant fund will invest in any specific securities that comprise any index, nor should it be understood to mean that there is a correlation between such fund's returns and any index returns.

Models may be misspecified, badly implemented or may become inoperative when significant changes take place in the financial markets or in the organization. Such a model could unduly influence portfolio management and expose to losses.

Emerging markets securities may be less liquid and more volatile and are subject to a number of additional risks including, but not limited to, currency fluctuations and political instability.

The strategy may include the use of derivatives. Derivatives often involve a high degree of financial risk because a relatively small movement in the price of the underlying security or benchmark may result in a disproportionately large movement in the price of the derivative and are not suitable for all investors. No representation regarding the suitability of these instruments and strategies for a particular investor is made.

LOIM does not provide accounting, tax or legal advice.

Although certain information has been obtained from public sources believed to be reliable, without independent verification, we cannot guarantee its accuracy or the completeness of all information available from public sources.

Views and opinions expressed are for informational purposes only and do not constitute a recommendation by LOIM to buy, sell or hold any security. Views and opinions are current as of the date of this presentation and may be subject to change. They should not be construed as investment advice.