〔Reference Translation〕

Fixed Income ESG Model and Performance Analysis

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▌Abstract ▐

1. The concept of investing with consideration to social responsibility and sustainability has developed considerably since the 2000s, largely centered on the equity market, and led particularly by European investors. In recent years, the increasing commitment by large Japanese public pension funds to ESG investment has triggered a surge in investor awareness and interest in ESG investing among Japanese institutional investors as well.
2. Still, on the topic of ESG in Fixed Income, there is widespread skepticism regarding the actual economic impact from considering such factors, and in some cases outright concern for potential negative impact on investment returns. Furthermore, certain ESG factors are normative in nature, and carry implicit value judgements that are not necessarily universally recognized or acceptable to clients in the Japanese investor community.
3. With these issues in mind, at Nomura Asset Management (NAM) we developed our own quantitative fixed income ESG model, specifically designed for systematic and transparent assessment of the down-side risk factors material to corporate credit investment. We have applied the model output in our investment processes from late 2018, and continue to actively upgrade the model.
4. To determine what effect the ESG risks assessed by our quantitative Fixed Income ESG model have on risk-adjusted returns in corporate credit markets, and whether it is economically rational to integrate these factors in the actual investment process, we back-tested the model against historical returns under certain preconditions.
5. We found that over the long term, issuers with higher (lower) NAM Credit ESG quality delivered higher (lower) risk-adjusted returns, in both US and European corporate credit markets. These results suggest that by constructing corporate bond portfolios with consideration for ESG factors based on an asset-class appropriate framework, it is possible to achieve superior investment performance through ESG integration.

Rising investor demand for comprehensive, high-quality, and potentially risk-return enhancing ESG integration in Fixed Income strategies in led Nomura Asset Management (NAM) to develop **a fully quantitative Credit ESG Model based on risk-and-return ESG factors**. Historical back-testing based on decades of index data indicates a **robust linear relationship between issuer NAM Credit ESG Scores and long-term risk-adjusted returns** in both European and US corporate credit markets. In this paper we describe our motivations and methods for developing a systematic approach to ESG integration and present proprietary quantitative analysis of the relationship between Credit ESG quality and investment performance with discussion.

I Background and Recognition of Challenges

While the rise of Sustainable finance has been ongoing for well over a decade, the investor focus on the ESG-integration aspect in investment processes has been arguably **centered on the equity asset class**, and particularly with a European perspective. Japanese investor awareness and interest developed later on but has now firmly taken hold among the country's institutional investors.

Still, despite now widespread interest in Japan on the topic of ESG, we encountered **widespread skepticism** that many common ESG factors and practices are either unsuitable, or irrelevant (or worse negative) for fixed income investment returns. **Certain ESG factors are normative in nature**, and carry implicit value judgements that are not necessarily universally recognized or acceptable to clients in the Japanese investor community. We believe that convincingly addressing these legitimate concerns, both to our clients and ourselves, is a necessary factor for **developing a truly sustainable fixed income investment practice** in Japan.

II Guiding principles for NAM's Fixed Income ESG Model

With this in mind, we decided to develop a comprehensive and practical fixed income ESG investment system **specifically designed for corporate credit strategies** that would be universally applicable, transparent, internally-consistent, resource-efficient, and – most importantly – **potentially alpha-generating**. In considering traditional off-the-shelf solutions from ESG ratings providers, three issues became apparent: 1) ESG ratings from third-party sources tend to be a **"black-box"** system that is difficult to comprehensively understand and explain, 2) ESG ratings **primarily reflect the concerns of equity investors** (in particular "upside opportunity" ESG factors) that in some cases have limited relevancy to down-side risk focused fixed income investors, and 3) ESG ratings **often mix normative screening factors with informative risk factors** that limit the resulting assessment's utility as an investment signal.

To address these issues, we exclusively focus the NAM Credit ESG Model on downside ESG risk factors

material to credit quality and financial risk, based on a transparent and internally consistent data-based process. As a result, our quantitative Credit ESG model generates scores by extracting and processing ESG-related data for each issuer based on a fully systematic framework, **distinct and separate from the judgmental ESG analysis** undertaken by credit analysts.

III Framework Overview

The NAM model framework is constructed in three steps: (1) Data Selection, (2) Data Mapping, and (3) Score Calculation.

In the first step (1) Data Selection, we select a subset of model inputs for assessing ESG factors from the universe of available data, based on guidelines defining the specific categories of ESG risk that the model is intended to reflect. Model inputs are chosen only for those ESG factors with the **objective potential to manifest as down-side market risk** based on issuer-specific aspects, e.g. contingent liabilities from negative externalities, loss of access to refinancing from reputational problems, long-term strategy and business model sustainability, etc. Data for inclusion in the model must also be consistent and continuously available. These data inputs measure the issuer's relative performance in material ESG factors such as GHG reduction strategy, human capital development, and accounting quality, etc.

We consciously **exclude ESG factors that describe "upside opportunities"** such as "green technologies" and "access to finance", as well as certain normative ESG factors that are not universally applicable as downside market risk. We also **avoid "high-frequency" type ESG data** that is reactive to news flow or recent controversies, in order to focus on long-term structural signals and preserve the forward looking-ness of the model output.

In the second step (2) Data Mapping, we classify these ESG data series into NAM "Sustainability Issues" that we consider fundamental to evaluating ESG credit risk, such as "GHG Emissions", "Product Safety" and "Governance Quality" etc. NAM Sustainability Issue scores **are calculated on an issuer basis** from the available input data from step (1). Sustainability Issues are further grouped into Environmental, Social, and Governance categories, according to our own concept for translating ESG into practical market risk considerations. This categorization can and sometimes does differ from the consensus formulation of ESG.

The E, S, and G scores are calculated as the average of each category's underlying Sustainability Issues. **Industry-specific weights for E, S, and G scores are determined by formula** from NAM's proprietary Materiality Map, as the relative importance of these categories is different for each industry. We apply a unique formula-based approach to derive the E, S, and G weights based on the relative number of Sustainability Issues deemed material to credit investors for each industry. I.e. the higher the number of

material sustainability issues present, the higher the relative E, S, or G weights.

In the third step (3) Score Calculation, we calculate the NAM Credit ESG Score for each issuer as the sum of the product of issuer ESG scores and industry ESG weights. **Data is updated each month for over 6000 global debt issuers**, for updated and comprehensive coverage.

The resulting NAM Credit ESG scores are integrated in the investment process for domestic and global corporate credit strategies, in a customized manner to suit each team's investment approach, mandate, and asset class.

IV Back-testing the NAM ESG Score Model

As the NAM ESG model inputs are selected to be "values-neutral" and downside-risk focused, the resulting output scores can **approximate a relative degree of "ESG market discount"** to be applied to issuers and sectors as a complement for traditional fundamental financial analysis. In fact, because the model is deterministic with fully quantitative output, **it is possible to back-test the NAM Credit ESG Model for performance** against historical market data, in ways that are not possible with subjective ESG assessments.

That said, the NAM Credit ESG model is not intended to be used as a "trading signal", and **we never optimize the framework for back-tested Sharpe Ratios** etc. Rather, we believe that ESG factors – when properly selected and considered from a forward-looking pricing perspective – can be a source of alpha for investors facing long-dated and in some cases unprecedented sources of risk. So we approach back testing of the NAM Credit ESG scores not for its value as a trading system component, but rather as a check of whether our particular formulation of ESG risk has informative value, and how these ESG signals can be harnessed for our investments.

V Back-test Analysis Methodology

We back-tested NAM Credit ESG scores for the universe of US and European corporate credit issuers to test the relationship between **ESG quality (ESG Credit scores) and historical risk and return** based on daily ICE BofA credit index data.

- The investment universe is defined as a company with NAM Credit ESG Score among ICE BofA's U.S. and European investment-grade corporate bond indices.
- For each issuer, we assumed that NAM Credit ESG score at the end of the backtesting was unchanged from the beginning. (See Box 1)

- At the end of each month, the issuer is divided into quartiles by NAM Credit ESG Score and a model portfolio is formed for each quartile. (We assume equal investment in each issuer; if one issuer have multiple bonds outstanding, we assume equal investment in all bonds.)
- The rebalancing of the portfolio is performed at the end of each month. Transaction costs are not considered.

The ESG data input used for the back-test was the single NAM Credit ESG score for each issuer, as this level of the score hierarchy incorporates the full spectrum of the model parameters for data selection, data weighting, and relative ESG factor materiality. These scores were then **bucketed into quartiles** with the resulting number 1-4 assigned to the issuer and used as the actual back-test variable. As a result, the **target of the analysis was on the relative level** of the issuer scores, more than the absolute level or relative position within the quartile.

Box 1: Explanation of methodological choices and limitations to the analysis

Because the necessary long-term historical ESG data inputs for the NAM Credit ESG model are not available and thus the **historical database of scores is limited**, we applied the most recent issuer score from a single point at the end of the back-test. This choice has several implications: first, we recognize that the back-test results are not entirely consistent since historical returns are being compared to current ESG scores. However, by empirical observation we note that the NAM Credit ESG scores do not actually change very much over time, and this is the expected outcome due to the data input choices that focus on long-term structural factors. Thus we assume that the issuers score is stable over time, at least relative to other issuer scores, and that the current score quartile is a valid proxy for historical levels.

Another issue is **survivorship bias**. Companies that have gone bankrupt or otherwise ceased to exist as independent entities due to merger and acquisition activity cannot not have ESG scores today, and thus are not included in the back-test results. This biases the back-test results depending on what the issuer's ESG score would have been at the time of bankruptcy (and presumably poor risk-adjusted-return). However we believe that the net effect will be to under-estimate the positive relationship between ESG quality and risk-adjusted-return, based on experience from recent actual high-profile bankruptcies where issuer scores were in the bottom quartile well before the change in price.

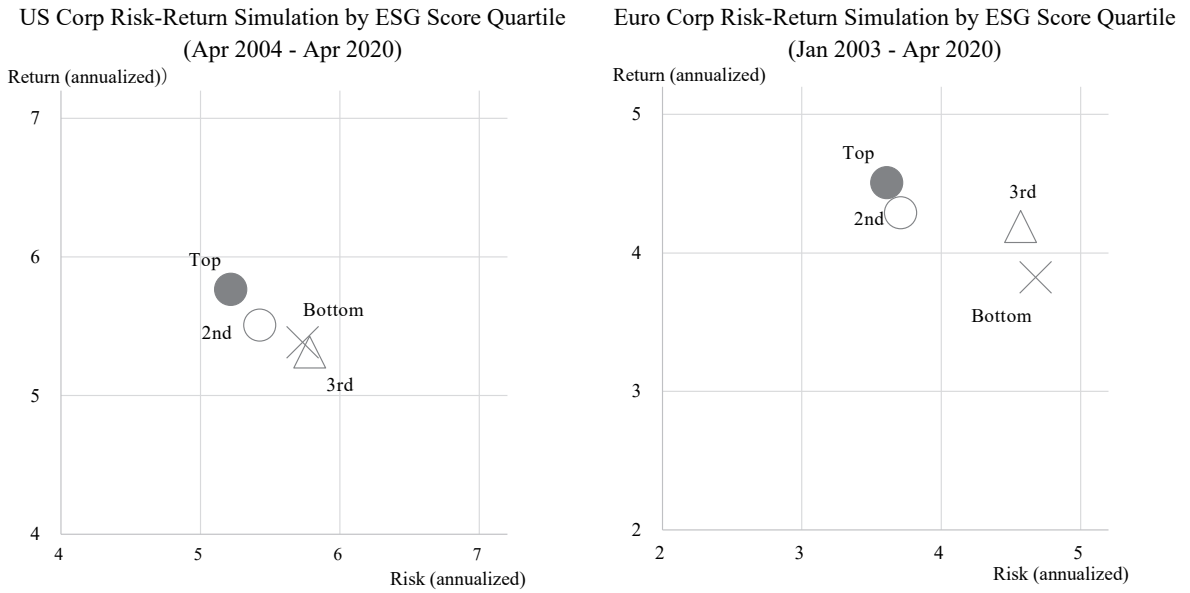
VI Results and Discussion

We found that corporate issuers with higher credit ESG quality (ie higher NAM Credit ESG score quartiles) **delivered higher risk-adjusted returns** during the observation period, in **both the US and European markets**. In almost every case, not only were risk-adjusted returns higher for higher ESG quality, but the level of returns was higher, and the level of risk (volatility) was lower, ie both aspects showed independent improvement with the ESG quality variable.

This indicates that corporate bond portfolios with **higher overall credit ESG quality may outperform** over the long run. These results corroborate the findings of other studies on ESG and market performance.

Figure 1: Long-term Return in the US/European Markets

(Unit: %)

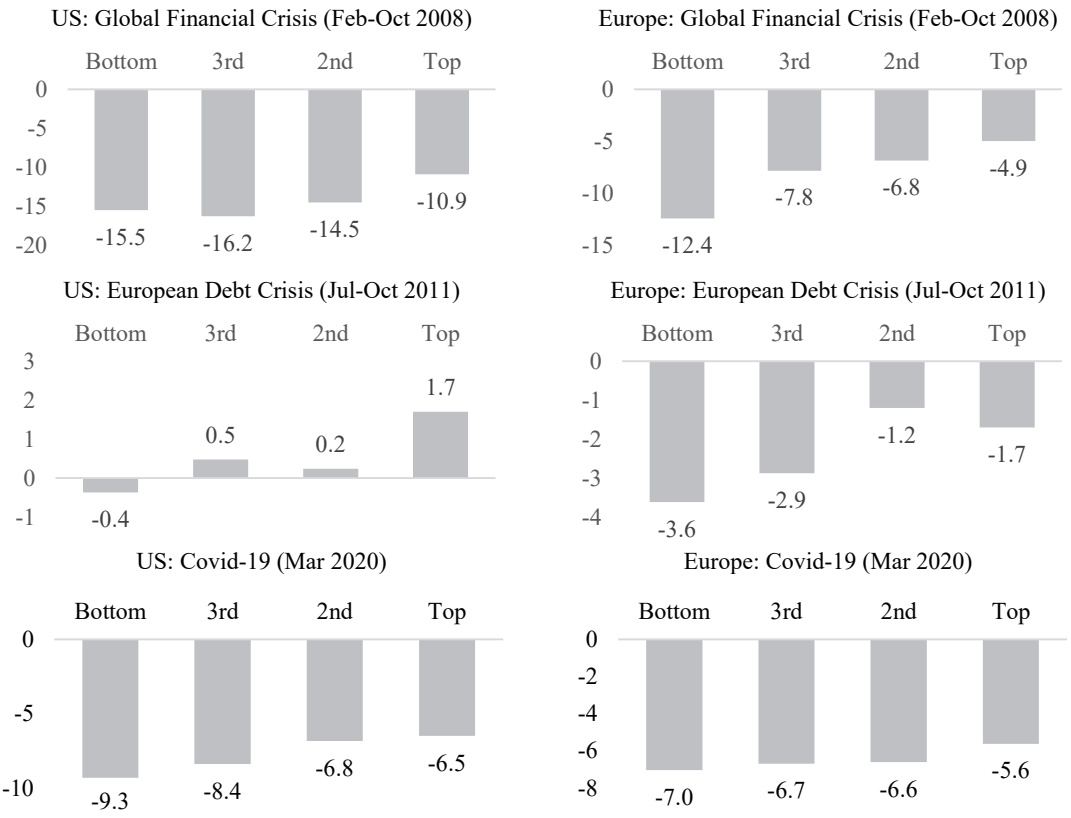


Source: ICE BofA indices, Nomura Asset Management calculations

We also individually analyzed select periods of credit market stress to test for a relationship between **issuer index price level drawdown and ESG quality**. The periods analyzed for both US and European markets were: Global Financial Crisis (February-October 2008), Emerging Market Selloff (March-September 2015), and Covid-19 Selloff (March 2020). Here again we found that higher ESG quality was negatively related to drawdown.

Figure 2: Long-term Return at the Market Turmoil

(Unit: %)



Source: ICE BofA indices, Nomura Asset Management calculations

These results give credence to the hypothesis that ESG quality is positively related to investment performance, and that **integrating ESG may have utility for investors** seeking to maximize risk-adjusted –returns in fixed income. In considering the results, we note that the lowest levels of ESG quality did appear correlated with both higher levels of risk (volatility) as well as lower total returns, consistent with our ESG score framework's explicit focus on downside factors and the avoidance of such risks. What was more surprising was that the opposite was also true – risk and return results were both maximized at the highest levels of ESG quality, possibly indicating a degree of **credit ESG quality "upside"**.

While we did not make specific adjustments for issuer size and credit rating in the back test, no clear differences in the issuer size or credit rating were identified among portfolios at the end of the back test.

VII Additional comments

We caveat these results with the following: First, given the data limitations we were in fact comparing past performance with current ESG quality (see Box 1 discussion), when contemporaneous or leading measures of ESG quality would have been more appropriate. Thus the results may be interpreted as "better risk adjusted performance leads to better ESG quality" which would be an interesting observation but less useful as a forward-looking indicator. Also, the results are based on the **proprietary formulation of ESG used by NAM Fixed Income** – other market participants may define and analyze ESG risks differently, with different results. Overall however, we do believe there is enough evidence to **convincingly reject the null hypothesis** that "ESG is unrelated or harmful to credit investment returns."

Second, ESG analysis is typically thought of as being focused on longer-term risks such as climate change, but **certain ESG factors appear to back-cast** from previous experience (particularly governance factors introduced specifically to explain certain Global Financial Crisis risk factors). These factors may fit with historical market outcomes, while actually becoming less relevant to Credit ESG quality and market outcomes over time. As a result, we believe it is important to periodically review the assumptions and data validity inherent in models of ESG quality, based on informed judgmental and objective assessment of what ESG factors can drive price and spreads, universally.

VIII Conclusion

These back-test results show that ESG Credit quality - as determined by NAM Credit ESG scores – appears to correlate positively with long term market risk-and-return for corporate credit issuers in the US and Europe. At Nomura Asset Management we research and systematically incorporate ESG performance analysis in the design and investment process across corporate credit and fixed income portfolios. **These insights are applied to investment portfolios**, contributing to the pursuit of superior risk-adjusted returns while building a more sustainable financial market in Japan one asset allocation decision at a time.