

PERSPECTIVE

Transition Finance to Drive an Economy-Wide Transition for a Net Zero Future

Sayuri Shirai / Keio University

JAPAN

Development of Transition Finance in Japan and Future Challenges

Akane Enatsu / Nomura Institute of Capital Markets Research

KOREA

Status and Challenges of Sustainable Finance in Korea: Environment and Finance

Suk Hyun / Yonsei University

SINGAPORE

Enhancing Transition Finance via Blended Finance: A Landscape Review

Guan Seng Khoo / Singapore Economic Forum

Annie Koh / Singapore Management University

THAILAND

Are ESG Ratings Noisy for Stock Returns? Evidence from Thailand's Stock Market

Wasin Siwasarit / Thammasat University

03	FOREWORD	
04	PERSPECTIVE	
		Transition Finance to Drive an Economy-Wide Transition for a Net Zero Future Sayuri Shirai Keio University
10	JAPAN	
		Development of Transition Finance in Japan and Future Challenges Akane Enatsu Nomura Institute of Capital Markets Research
13	KOREA	
		Status and Challenges of Sustainable Finance in Korea: Environment and Finance Suk Hyun Yonsei University
16	SINGAPORE	
		Enhancing Transition Finance via Blended Finance: A Landscape Review Guan Seng Khoo Singapore Economic Forum Annie Koh Singapore Management University
22	THAILAND	
		Are ESG Ratings Noisy for Stock Returns? Evidence from Thailand's Stock Market Wasin Siwasarit Thammasat University
28		Introducing Nomura Foundation
30		Introducing Nomura Institute of Capital Markets Research



FOREWORD

This issue of *Nomura Journal of Asian Capital Markets* features articles from experts on the themes of sustainable finance and environmental, social, and governance (ESG) investing in major Asian countries.

Sayuri Shirai, Professor on the Faculty of Policy Management at Keio University, provides insights into the whole-of-economy transition toward net zero carbon emissions and the frameworks for financing the transition. Her article includes a sample classification of the whole-of-economy transition, key elements of a reliable transition plan, and examples of economic activities contributing to the transition. In addition, the article introduces three existing approaches to identifying entities that are committed in their decarbonization efforts.

Akane Enatsu, Head of Nomura Sustainability Research Center at Nomura Institute of Capital Markets Research, discusses the development and challenges of transition finance in Japan. The Japanese government has been making various efforts to promote transition finance. The government issued the world's first sovereign climate transition bonds in February 2024. Major challenges for realizing a decarbonized society include creating a positive image of transition finance and greater international cooperation.

Suk Hyun, Professor and Head of the Graduate School of Environmental Finance at Yonsei University, writes about the status and challenges of sustainable finance in Korea. The Korean government has introduced ESG management guidelines and taxonomies to promote the sustainability of domestic companies. The sustainable finance market has grown, leading to an increase in institutional investors' investments in ESG bonds. However, there are numerous ESG challenges including improvement in disclosure and enhancement of impact assessment.

Guan Seng Khoo, APAC Advisory Council Member of Singapore Economic Forum, and Annie Koh, Professor Emeritus of Finance (Practice) at Singapore Management University, present the challenges and opportunities of transition finance globally and Singapore's efforts to promote transition finance. Their article highlights the importance of public-private partnerships and recommends the use of blended finance in promoting transition finance in the ASEAN region.

Wasin Siwasarit, Lecturer at the Faculty of Economics, Thammasat University, analyzes ESG ratings and stock performance in Thailand. The relationship between ESG ratings and stock performance remains uncertain, and there is no consensus on the application of ESG in investment management. ESG rating agencies provide diverging ESG scores because they use different data sources and models. His analysis suggests that investors should reference several different ESG ratings in investment management.



SAYURI SHIRAI

Keio University

Transition Finance to Drive an Economy-Wide Transition for a Net Zero Future

Introduction

Transition finance aims to promote not only green or near-green activities but also emissions-intensive sectors, including hard-to-abate sectors, that make efforts to substantially reduce greenhouse gas (GHG) emissions. Currently, the market for transition finance particularly supporting emissions-intensive sectors lags the relative popularity of green, sustainability, and sustainability-linked bonds globally. This reflects the fact that some investors associate transition finance with greenwashing, while others are cautious about financing emissions-intensive companies due to the lack of common definitions and criteria applied to their targets and decarbonization pathways.

Main sources of GHG emissions

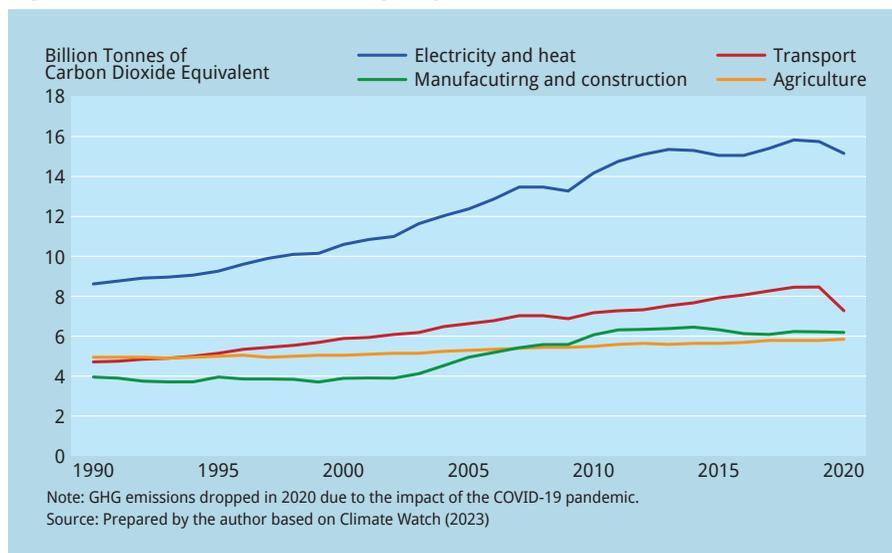
In financing the process of promoting the whole-of-economy transition to net zero, it is important to know where GHG emissions concentrate across sectors and what emissions reduction challenges these sectors face. According to Climate Watch (2023), electricity and heat, transport,

manufacturing, and construction account for about 70% of GHG emissions globally (Figure 1). Among them, electricity and heat account for more than 30% of total global emissions, followed by transport (15%), manufacturing and construction (13%), and agriculture (12%). Other emission sources include aviation, shipping and bunker fuels, buildings, changes in land use, and waste management.

While many entities (or companies) in these sectors are currently emissions-intensive, their GHG emissions can be reduced by using existing technologies. Emis-

sions can be reduced by improving energy efficiency; increasing renewable energy and electric vehicles (EVs); and promoting the electrification of industrial and energy use in buildings. To promote widespread adoption, however, further advancement of these technologies, improvement in their affordability, and a rapid increase in their supply base are essential. Accelerating these green activities should also involve expanding enabling activities and their associated technologies—such as energy storage and batteries, power grids, heat pumps, recycling and reutilization,

Figure 1: Global GHG Emissions by Major Sectors



and low-carbon alternatives. The mining and processing of rare and precious metals are also associated with the production and widespread adoption of renewable energy and EVs. Entities are expected to reduce GHG emissions further from these mining and refining activities and address other environmental impacts, as well as social issues such as human rights and workers' rights.

Reducing emissions in agriculture, forestry, and other land uses could be implemented, for example, by restoring soil, peatlands, and woodlands; promoting carbon and regenerative farming; and developing blue carbon ecosystems. Producing protein alternatives or plant-based dairy products is also an important innovation to reduce emissions from beef production.

It will be desirable for a wide range of the aforementioned activities and technological advancements to be undertaken at a faster-than-current pace in the future. Even if that were achieved, however, it would be difficult to reduce global GHG emissions completely to net zero due to the presence of hard-to-abate sectors. About 20-30% of global GHG emissions come from these sectors. These sectors substantially emit GHG by utilizing fossil fuel-based energy and high-temperature processes, but a substantial emissions reduction is considered difficult at the current stage due to the challenges related to electrifying all their production and operational processes, the limited availability of low-carbon alternatives, and the long lifespan of their assets. Hard-to-abate sectors generally include aluminum, cement, glass, iron and steel, basic chemicals, paper and pulp, petrochemicals, fertilizer, heavy-duty trucking, marine transport and shipping, aviation, construction materials (e.g., concrete), and waste management. Additionally, some countries consider fossil fuel-based electricity as part of the hard-to-abate sectors. All these sectors require new types of technologies and substantial investment. If the status quo is maintained, emissions from these sectors are likely to rise significantly in emerging and developing economies with growing, young labor forces, high economic growth, and a rising role as global supply chain hubs.

The information and communication technology (ICT) sector, particularly with the use of big data, artificial intelligence (AI), and blockchain technology, is expected to play a crucial role in supporting emissions reductions or the removal of carbon dioxide (CO₂) from the atmosphere in the aforementioned greener and emissions-intensive sectors. Promoting

energy savings, reducing demand-supply mismatches of renewable energy through better demand-supply forecasting, monitoring forest conditions more effectively, tracking sustainable materials, and estimating the carbon footprints of customers' purchases are increasingly becoming feasible with the promotion of digitalization. While the ICT sector could be viewed as one of the enabling sectors, it requires substantial energy for operating data centers, manufacturing ICT equipment, and using blockchain-based tracking systems. Thus, reducing emissions from ICT and related activities must be implemented together.

Emissions may remain large for some sectors even after efforts to utilize and develop the aforementioned measures and technologies. In this case, using carbon capture and storage (CCS) and carbon capture, utilization and storage (CCUS) technologies could be considered as possible options, provided CO₂ can be stored permanently. The regional availability of geological storage, technology advancement, and better cost performance, meanwhile, are important challenges to exploit these technologies. CCS and CCUS technologies are likely to be used more intensively in hard-to-abate sectors. Other measures to reduce GHG emissions from the atmosphere and store them permanently, known as carbon dioxide removal (CDR) measures, should be explored. CDR measures are comprised of nature-based and technology-based solutions. Nature-based solutions include afforestation, reforestation, and the restoration of wetlands and peatlands, some of which are already mentioned above. Technology-based solutions generally comprise direct air capture (DAC) and bioenergy with CCS (BECCS), which capture CO₂ from biomass.

Divergent approaches to transition finance

To financially support those investments and innovative activities in emissions-intensive sectors, including hard-to-abate sectors and associated enabling sectors, scaling up transition finance must be promoted and undertaken promptly. Expanding the investor base must be done by mitigating greenwashing concerns. The Organisation for Economic Co-operation and Development (OECD) Industry Survey on Transition Finance revealed that more than 60% of investors were hesitant to provide transition finance due to inadequate clarity on how to assess credible corporate alignment with a pathway that is consistent with the Paris Agreement's goals (OECD 2022).

There are some initiatives related to transition finance (see Shirai [2023] for details). While all these approaches share the common goal of advancing transition finance, there are notable disparities in their methodologies. These discrepancies encompass data prerequisites (including Scope 3 emissions data and targets), alignment with the net zero or 1.5°C pathway, the presence of time-bound criteria or thresholds, as well as the utilization of science-based (or evidence-based) criteria and employing carbon budgets. This paper aims to provide some insights on the whole-of-economy transition toward net zero, aiming to enhance the credibility and transparency of corporate disclosures. Section 2 will focus on the issues of classifying the whole-of-economy transition into entities and activities. Section 3 focuses on existing approaches related to entities, and Section 4 offers conclusions.

Assessing the Whole-of-Economy Transition Process

In promoting transition finance, it is useful to look at the pathway of transitioning the whole economy toward net zero by treating entity- (or corporate-) level and activity-level separately. This is because large companies often engage in several activities across multiple sectors or within the same sector. In this case, decarbonization efforts need to be examined per activity in each sector while also ensuring that the aggregation of those emissions reduction efforts is consistent with the decarbonization pathways toward net zero at an entity-level across the value chain. In general, emissions-intensive companies pursue emissions reductions using existing technologies but also engage in various other activities and technological options in a flexible manner during the process of making emissions-cutting efforts at an entity-level. Investors could finance several diverse activities and innovations that could actually or potentially reduce emissions, anticipating that such finance could eventually lead to a steady reduction at the entity-level and across the entire value chain. Activities could be differentiated by sector as well as by technological features and feasibility.

Identifying entities contributing to the whole-of-economy transition

In principle, nearly all entities in the world need to make efforts to reduce GHG emissions to achieve net zero (Figure 2). Entities need to align with the 1.5°C targets and pathways regarding Scope 1 and Scope 2 emissions, and, if material, Scope 3 emissions. According to the GHG Protocol, Scope 1 and Scope 2 refer to direct emissions and emissions from purchased electricity, respectively, while Scope 3 emissions are from suppliers and users and comprise 15 categories. Globally, very few entities are currently aligned with the 1.5°C targets and associated pathways. These entities, together with entities with nearly zero emissions, could be called “Aligned Entities.” Some entities are already making efforts to align with the 1.5°C targets and pathways or at least with the well-below-2°C targets and pathways. These entities are not yet aligned with the 1.5°C targets and pathways, but they could be candidates for “Aligning Entities” under certain conditions (such as timelines of alignment and credible transition plans). So far, many other entities have not yet launched emissions reduction initiatives, and these entities are neither Aligned nor Aligning Entities. As pointed out above, hard-to-abate sectors may require special attention and disclosure requirements to be eligible for “Aligning Entities,” given the greater technological and cost challenges.

A growing number of large entities globally have begun to reduce GHG emissions in some activities, although their emissions remain substantial overall. In

electricity generation, for example, it is desirable for power companies to increase renewable or other low-carbon energy sources soon. However, power companies in some countries may find it difficult to do so on a significant scale in the immediate future due to heavy dependence on fossil fuels, limited availability of renewable energy, or other country-specific reasons. In such cases, power companies may try to increase renewable energy generation over time while continuing to operate fossil fuel-fired power plants, primarily relying on increasingly efficient plants. At the same time, companies may conduct experiments on co-firing with hydrogen at fossil fuel power plants and invest in CCS or CCUS facilities.

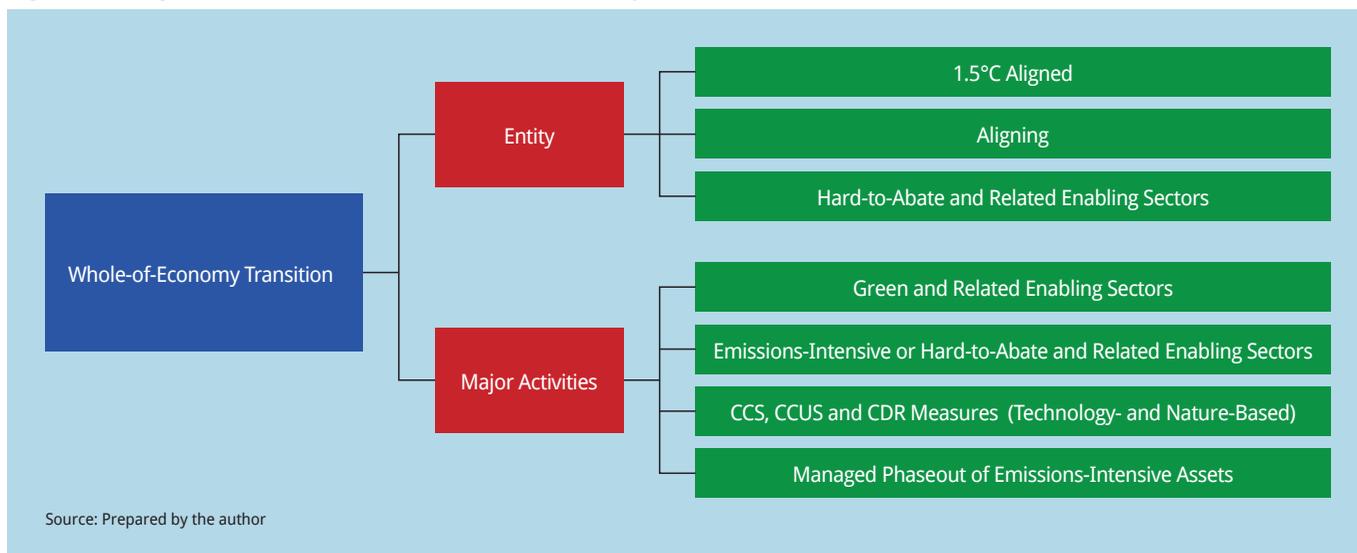
In this case, investors may wish to know whether the power companies’ overall emissions reduction pathways are consistent with the 1.5°C pathways, as well as the technological and cost performance potential of utilizing new technologies (hydrogen or CCS and CCUS). Such companies need to present their overall decarbonization strategies in their transition plans, which should include several activity- or technology-based options and progress concerning the commercial feasibility of new technologies. Actions related to power companies could comprise green activities (e.g., power generation using renewable energy), closing inefficient fossil fuel power plants, installation of CCS and CCUS facilities, and experimentation with co-firing hydrogen. Hydrogen can be emissions-intensive if production uses fossil fuels, or green if renewable energy is used. Over time, companies’ emissions might be re-

duced as technological advancements enable a higher mixing ratio of hydrogen and more green hydrogen or abated hydrogen become available.

Another example is the case of car and truck manufacturers that are attempting to reduce GHG emissions throughout the entire value chain. They may plan to do so by producing more hybrid vehicles and further shifting to EVs and fuel cell vehicles (FCVs). Meanwhile, developing biofuels and e-fuels using hydrogen can be promoted. In this case, the companies implement diverse actions comprising green activities (such as producing EVs and FCVs), less emissions-intensive activities (e.g., producing hybrid cars), increasing use of more sustainable materials and inputs, and developing biofuels and e-fuels using hydrogen. As the availability of renewable energy improves, the use of green hydrogen could be expanded, or emissions-intensive hydrogen can be abated with CCS and CCUS.

To prepare a credible transition plan, entities in carbon-emissions sectors are expected to set net zero targets by 2050 at the latest, along with associated short- and medium-term targets. These targets are expected to be science-based and in line with the Paris Agreement goals. It is also desirable to set sector-based decarbonization pathways based on carbon budget concepts. Large entities engaged in multiple sectors may cover several sectoral-based pathways. Emissions-intensive entities also need to look at the pathways of enabling activities as part of the value chain and due to the need to disclose all scopes of emissions (Scopes 1, 2, and 3). Using sectoral

Figure 2: Sample Classification of the Whole-of-Economy Transition



technical screening criteria that include quantitative thresholds and timelines reflecting the latest information and adjusting for country-specific conditions could be useful to increase investors' trust.

It is ideal for entities to reduce GHG emissions linearly toward net zero by around 2050. In practice, actual decarbonization pathways vary significantly by sector, available technologies or advancements in new technologies, cost performance, installation of CCS and CCUS facilities, utilization of CDR measures, and country-specific circumstances. Country-specific circumstances could include the availability of affordable low-carbon energy, green hydrogen, various emissions-cutting technologies, as well as the size of fiscal support obtained domestically or from other countries, companies, or investors. For hard-to-abate sectors, it may be useful for entities to disclose progress related to new technologies leading to substantial emissions reduction in terms of technological and cost performance (Figure 3).

Classifying the whole-of-economy transition into activities

To promote the whole-of-economy transition to a net zero or 1.5°C pathway, a wide range of activities should be pursued by entities, as already pointed out. Following the aforementioned discussion, these activities could be decomposed into (1) green or near-green activities, as well as related enabling activities; (2) emissions-intensive and/or hard-to-abate sectoral activities

that are making efforts or planning to reduce emissions and associated enabling activities; (3) CCS and CCUS; (4) CDR measures; and (5) managed phase-out of emissions-intensive assets (Figure 2). Both activities (1) and (2) should take into account the life cycle emissions and Scope 3 emissions. Their enabling activities refer to those that have the potential to enable substantial GHG emissions reductions in other sectors and should take life cycle considerations into account as well. ICT-related activities could make significant contributions to emissions reductions in activities (1) and (2). CCS and CCUS could be included as enabling activities of (1) and (2), but they are treated separately due to the unique nature of technologies to capture and store emissions, which could potentially be essential in certain sectors.

For example, (1) green activities may refer to generating renewable energy and producing EVs, while their related enabling activities could include the production of related equipment, batteries and storage, grids, precious metals, heat pumps, hydrogen, as well as the utilization of ICT and transportation. Meanwhile, (2) emission reduction efforts in hard-to-abate sectors include activities closely associated with hydrogen reduction steel, chemical, and aluminum production; using electric arc furnaces, using electrolysis to produce chemicals, and using electric heating equipment to produce aluminum; and developing aviation powered by hydrogen fuels or batteries, etc. Enabling activities that support these efforts could be the pro-

duction of hydrogen, batteries, and renewable energy.

Economic activities could consider information from sectoral criteria developed by the Climate Bonds Initiative (CBI), based on the 1.5°C alignment, as a reference. These criteria are consistent with the 1.5°C alignment, and thus limited focus is provided on the transitioning process, known as “transitional activities.” Meanwhile, taxonomies developed by the Association of Southeast Asian Nations (ASEAN) and some ASEAN member countries, such as Singapore, Indonesia, and Thailand, designate green and transitional activities under the traffic light classification system (e.g., green; amber or transitional; or red or ineligible). The treatment of these transitional activities varies, for example, depending on how differently sourced hydrogen is treated and how CCS or CCUS facilities are taken into account. There is no clear consensus yet as to whether black or brown hydrogen (hydrogen made from black or brown coal) and/or grey hydrogen (hydrogen made from natural gas) should be completely excluded from activities contributing to transitioning some sectors to low-carbon targets worldwide. Green hydrogen and blue hydrogen (black, brown, and grey hydrogen with CCS or CCUS technologies) are preferred over black, brown, and grey hydrogen. Figure 4 illustrates various activities that could actually or potentially contribute to emissions reduction. Over time, many of these activities are expected to reduce emissions based on lifetime considerations.

Figure 3: Key Elements of a Credible Transition Plan

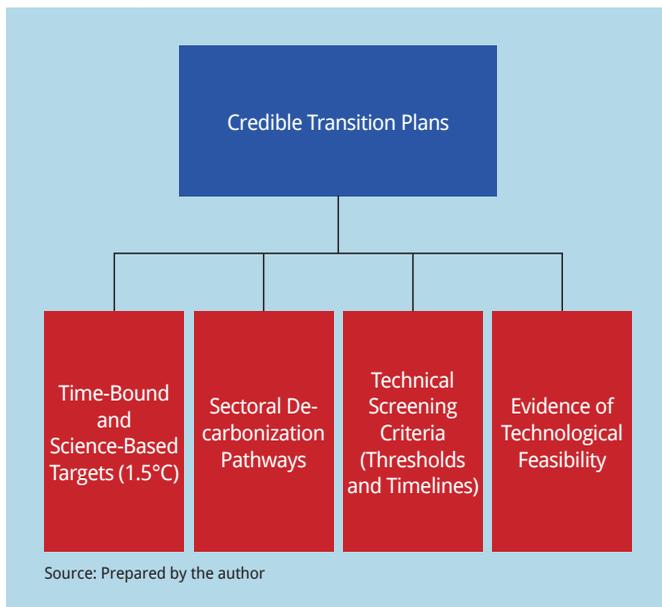
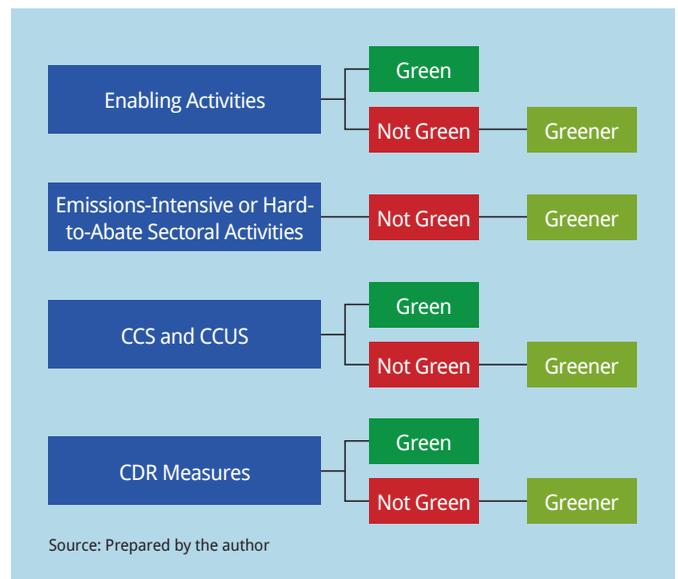


Figure 4: Illustrative Example of Activities Contributing to the Whole-of-Economy Transition



Overview of Three Existing Approaches to Identifying Entities

This section sheds light on three existing approaches developed with the aim of enhancing the credibility of entities' commitment to decarbonization efforts. The first approach is developed by the Science-Based Targets initiative (SBTi) to certify targets aligned with a 1.5°C trajectory. Entities with certified targets could be regarded as Aligned Entities based on detailed decarbonization pathways developed for certain emissions-intensive sectors. The second approach is a certification and labeling scheme developed by CBI to certify Aligned Entities and Transition Entities from the perspective of the 1.5°C alignment. The third approach, developed by the Glasgow Financial Alliance for Net Zero (GFANZ), also labels Aligned Entities and Aligning Entities, aiming to encourage transition finance among investors.

Setting science-based targets to enhance credibility of entities

To enhance the credibility of entities' decarbonization efforts, investors increasingly prioritize science-based targets and associated sector-specific pathways. The most well-known science-based targets are those certified by the SBTi. The focus is on offering the Net Zero Standard Criteria aimed at encouraging companies to adopt 1.5°C-aligned SBTs (SBTi 2023). The time frame for these targets is divided into near-term (5–10 years) and long-term SBTs (net zero by 2050 or earlier). The targets encompass Scope 1 and Scope 2 emissions, with at least 95% coverage of all such emissions. Scope 3 emissions are to be included if they account for 40% or more of total Scope 1, 2, and 3 emissions. Entities must establish 1.5°C-aligned Scope 1 and Scope 2 targets to be accomplished within 5–10 years. Achieving these near-term targets necessitates the implementation of actions that significantly reduce emissions by around 2030.

In establishing the targets, the SBTi offers two approaches: the cross-sector Absolute Contraction Approach and, for certain sectors, the Sectoral Decarbonization Approach. The former applies a consistent absolute emissions reduction rate across all sectors, aligning with global decarbon-

ization trajectories. All applicable companies are required to reduce emissions at a minimum fixed annual rate of 4.2%. The Sectoral Decarbonization Approach is prepared for establishing emissions targets for emissions-intensive sectors, including hard-to-abate sectors. Based on the carbon budget approach, the SBTi developed a sector-specific emissions corridor. The SBTi's near-term targets for entities are established along their convergence trajectory. The SBTi offers specific requirements and guidance aligned with the 1.5°C pathway for emissions-intensive sectors—including aluminum, apparel and footwear, aviation, buildings, chemicals, cement, financial institutions, ICT, maritime, oil and gas, power, steel, and transport.

CBI's approach to aligned and transition entities

CBI, which has been providing the criteria for labeling green and other labeled bonds, has introduced a labeling scheme for non-financial entities (CBI 2024). Based on the Climate Bonds Standard and the Sector Criteria, entities are certified as Aligned or Transition in terms of alignment with the 1.5°C pathway. An entity needs to identify activities included within the 90% certification threshold and those outside of the boundaries, along with explanations. The certification is valid for five years from the date of certification. The two levels of certification depend on when the Climate Mitigation Performance Targets align with the Sector Criteria: Level 1 (Aligned) and Level 2 (Transition).

- 1. Level 1 (1.5°C Aligned):** The Climate Mitigation Performance Targets align with the Sector Criteria at the time of certification and thereafter until the date the Climate Mitigation Performance Targets represent net zero emissions or 2050, whichever comes sooner.
- 2. Level 2 (Transition):** The Climate Mitigation Performance Targets do not align with the Sector Criteria at the time of certification but align by the end of December 2030, and thereafter until the date the Climate Mitigation Performance Targets represent net zero emissions or 2050, whichever comes sooner.

An entity needs to have a transition plan that incorporates strategies, including visions about future activities, assets, and business models, to achieve the emissions reduction targets. The targets must include

interim targets on a three-yearly basis for the nine years after the certification date and on a five-yearly basis thereafter over the full-time horizon. The interim targets should also align with CBI's Climate Bonds Standard Sector Criteria and be aligned with those Criteria by the end of 2030 at the latest. The targets encompass Scope 1 and Scope 2 emissions for all companies, and Scope 3 emissions if the relevant Climate Bonds Standard Sector Criteria address those three emissions. The Sector Criteria are comprehensive, incorporating green and enabling activities, as well as emissions-intensive and hard-to-abate sectors and their enabling activities.

GFANZ's transition finance approaches to entities

In view of promoting investors to finance the whole-of-economy climate transition toward net zero, The GFANZ Secretariat identified four strategies: (1) climate solutions, (2) aligned, (3) aligning, and (4) managed phaseout, all of which are collectively called transition finance (GFANZ 2023). Among them, two strategies related to entities are highlighted as entry-level classification.

Aligned Entities: The Aligned strategies aim at financing entities that are already aligned to a 1.5°C pathway. Thus, the strategies apply to consecutive stages in an entity's transition toward net zero, delineating the entity's level of commitment and progress toward operations consistent with a net zero pathway.

Five Attributes for Aligned Entities:

- A commitment or stated ambition to reach net zero with pathways or benchmarks specified.
- Establishment of net zero targets covering interim targets and emissions-based key performance indicators (KPIs) covering Scopes 1, 2, and 3 (if material).
- Net zero transition plan should be established and implemented.
- Additional KPIs (where applicable) may be considered in the identification of Aligned Entities (e.g., low-carbon revenues or low-carbon capex).
- Entities are expected to show alignment to pathways and actual performance against their targets for two continuous years.

Aligning Entities: The Aligning strategies aim at financing entities that are committed to transitioning in line with 1.5°C-aligned pathways. Thus, the strategies apply to consecutive stages in an entity's transition toward net zero, delineating the entity's level of commitment, and progress toward operations consistent with a net zero pathway.

Five Attributes for Aligning Entities:

- A commitment or stated ambition to reach net zero with pathways or benchmarks specified.
- Established net zero targets (set to pathway): Establishment of net zero targets including interim targets and emissions-based KPIs covering Scopes 1, 2, and 3 (if material).
- Net zero transition plan should be under development.
- Additional KPIs may be considered in the identification of Aligning Entities (e.g., low-carbon revenues or low-carbon capex).
- Aligning Entities are converging toward pathways and expected to meet interim targets.

GFANZ's approach to Aligned Entities appears to be roughly consistent with the SBTi and CBI approaches due to its emphasis on net zero targets and Scope 1, 2, 3 emissions data. While both CBI and GFANZ emphasize transition plans, GFANZ's approach is somewhat ambiguous regarding sectoral decarbonization approaches and hard-to-abate sectors. Additionally, GFANZ's attributes related to Aligning Entities appear less ambitious than CBI's classification of Transition Entities due to the lack of timeline and details in the transition plan.

Conclusions

This paper focused on the whole-of-economy transition toward net zero and offered additional insights to clarify the transition finance frameworks by distinguishing enti-

ties and activities separately. To assess the alignment of entities, this paper focused on the three approaches adopted by SBTi, CBI, and GFANZ, all of which pay attention to alignment with net zero targets and 1.5°C pathways. Further discussions are necessary to define Aligning or Transition Entities since there appears to be a large divergence between these criteria. Another issue is that setting targets and pathways following the SBTi and CBI approaches may not be sufficient in hard-to-abate sectors due to a high degree of technological and cost performance uncertainties. Some evidence from various experiments related to new emissions-reducing technology may be additionally needed. This paper could be a useful starting point to develop more credible transition finance approaches taking into account country- and region-specific conditions.

References

- Climate Watch. 2023. Historical GHG Emissions, Latest Update 31 October. https://www.climatewatchdata.org/ghg-emissions?end_year=2020&start_year=1990
- Climate Bonds Initiative. 2024. Climate Bonds Standard: Globally Recognised, Paris-Aligned Certification of Debt Instruments, Entities and Assets Using Robust, Science-Based Methodologies, February. <https://www.climatebonds.net/files/files/climate-bonds-standard-v4-1-202403.pdf>
- Glasgow Financial Alliance for Net Zero. 2023. Scaling Transition Finance and Real-economy Decarbonization: Supplement to the 2022 Net-zero Transition Plans Report, GFANZ Secretariat Technical Review Note, 1 December. <https://assets.bbhub.io/company/sites/63/2023/11/Transition-Finance-and-Real-Economy-Decarbonization-December-2023.pdf>
- International Energy Agency. 2021. Net Zero by 2050, International Energy Agency <https://www.iea.org/reports/net-zero-by-2050>
- Organization for Economic Co-operation and Development. 2022. OECD Guidance on Transition Finance, 3 October. <https://www.oecd.org/environment/oecd-guidance-on-transition-finance-7c68a1ee-en.htm>
- Science-Based Targets initiative. 2023. SBTi Corporate Net-Zero Standard Criteria Version 1.1. April. https://sciencebasedtargets.org/resources/files/Legacy_Net-Zero-Standard_v1.1.pdf (accessed 30 November 2023)

Shirai, Sayuri. 2023. An Overview of Approaches to Transition Finance for Hard-to-Abate Sectors, 7 December. <https://www.adb.org/publications/an-overview-of-approaches-to-transition-finance-for-hard-to-abate-sectors>



SAYURI SHIRAI

Professor, Faculty of Policy Management, Keio University

Sayuri Shirai is a professor on the Faculty of Policy Management at Keio University. She also serves as an Advisor for Sustainable Policies at the Asian Development Bank Institute (ADBI). She launched the ADBI-ADB Climate Finance Dialogue, a pivotal initiative to promote information exchange and understanding about climate-related disclosure and related policies among financial supervisors and central banks in Asia and the Pacific region.

Previously, she held a senior advisory role at Equity Ownership Services (EOS), part of Federated Hermes, Ltd., in London where she played a vital role in providing environmental, social, and governance (ESG) stewardship services to listed companies worldwide. She served as a Member of the Policy Board of the Bank of Japan (BOJ) from 2011 to 2016. Prior to that, she taught at Institut d'Études Politiques de Paris (Sciences Po) and worked as an economist at the International Monetary Fund (IMF).

She has authored books and papers covering diverse topics such as green central banking, innovative climate finance, monetary policy, and other international finance issues. Her recent books include, in English, *Global Climate Challenges, Innovative Finance, and Green Central Banking*, published in 2023 and, in Japanese, *Environment and Business* published in July 2024.

She holds a Ph.D. in Economics from Columbia University.



AKANE ENATSU

Nomura Institute of Capital Markets Research

Development of Transition Finance in Japan and Future Challenges

Promotion of Finance for a Decarbonized Society in 2050

A global movement to realize a decarbonized society has been accelerating since the 2015 international agreements on Sustainable Development Goals (SDGs) and the Paris Agreement. In Japan, then-Prime Minister Yoshihide Suga declared in October 2020 that Japan would aim to become a decarbonized society by 2050 by reducing greenhouse gas (GHG) emissions to virtually zero and achieving carbon neutrality.

Realizing a decarbonized society will require the expansion of industries and businesses that do not emit GHGs. However, some industries and businesses emit large amounts of greenhouse gases and are technically difficult to decarbonize in a short period of time. In order to achieve a decarbonized society, it is necessary to support a broader transition, including energy conservation and fuel conversion, in addition to addressing already decarbonized businesses.

A smooth transition to a decarbonized society is expected to require significant financial resources. In the case of

Japan, the government estimates that in order to achieve the 2050 carbon neutrality target as well as to strengthen industrial competitiveness and achieve economic growth at the same time, public and private investment in green transformation (GX) will need to exceed JPY150 trillion over the next ten years. Against this background, the government has taken various measures to promote transition finance toward the realization of a decarbonized society since the beginning of the 2020s. Transition financing has also been growing steadily since then.

This paper examines the development of transition finance and the financing situation in Japan and discusses the challenges for realizing a decarbonized society.

Development of Transition Finance

This history of transition finance started with the issuance of the world's first transition bond in July 2017 by Castle Peak Power Finance Company Limited, a subsidiary of a Hong Kong electric power company. In December 2020, the International Capital Market Association (ICMA) published

its first Climate Transition Finance Handbook (CTFH), contributing to greater global awareness of transition finance.

In Japan, the Financial Services Agency (FSA), the Ministry of Economy, Trade and Industry (METI), and the Ministry of the Environment (MOE) published Japan's Basic Guidelines for Climate Transition Finance (the Basic Guidelines) in May 2021. Based on the four elements outlined in the ICMA's CTFH (issuer's climate transition strategy and governance, business model environmental materiality, climate transition strategy and targets to be science-based, and implementation transparency), the Basic Guidelines describe issues related to disclosure, matters to be disclosed and supplementary information, and issues related to independent reviews.

In addition, METI has developed technology roadmaps that provide concrete directions for eight GHG-intensive industries (iron and steel, chemicals, electric power, gas, oil refining, cement, pulp and paper, and automobiles) to follow from FY2021 as they seek to transition to carbon neutrality in 2050. The roadmap is intended to be referenced by companies as they consider climate change measures funded by transition finance. It is also intended as a reference for financial institutions to determine whether companies' strategies and initiatives toward decarbonization qualify them to use transition finance when procuring funds. In addition to METI's roadmap, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT)

has developed a roadmap for the shipping and aviation industries. Combined, these two roadmaps cover approximately 80% of Japan's carbon dioxide (CO2) emissions.

METI also has been implementing its Transition Finance Model Project and Subsidy for Global Warming Countermeasures Promotion Project since FY2021 to accumulate and disseminate information about projects considered to be good examples of transition finance. Model projects and subsidized projects receive government support to cover the costs of external assessments of the project's eligibility for transition finance. In June 2023, the FSA, METI, and MOE formulated a guidance for fixed-income investors that summarizes the key points to follow up on after providing funds through transition finance.

In addition to the government's measures, the Funds-Supplying Operations to Support Financing for Climate Change Responses (Climate Response Financing Operations) launched by the Bank of Japan (BOJ) in December 2021 may have helped to stim-

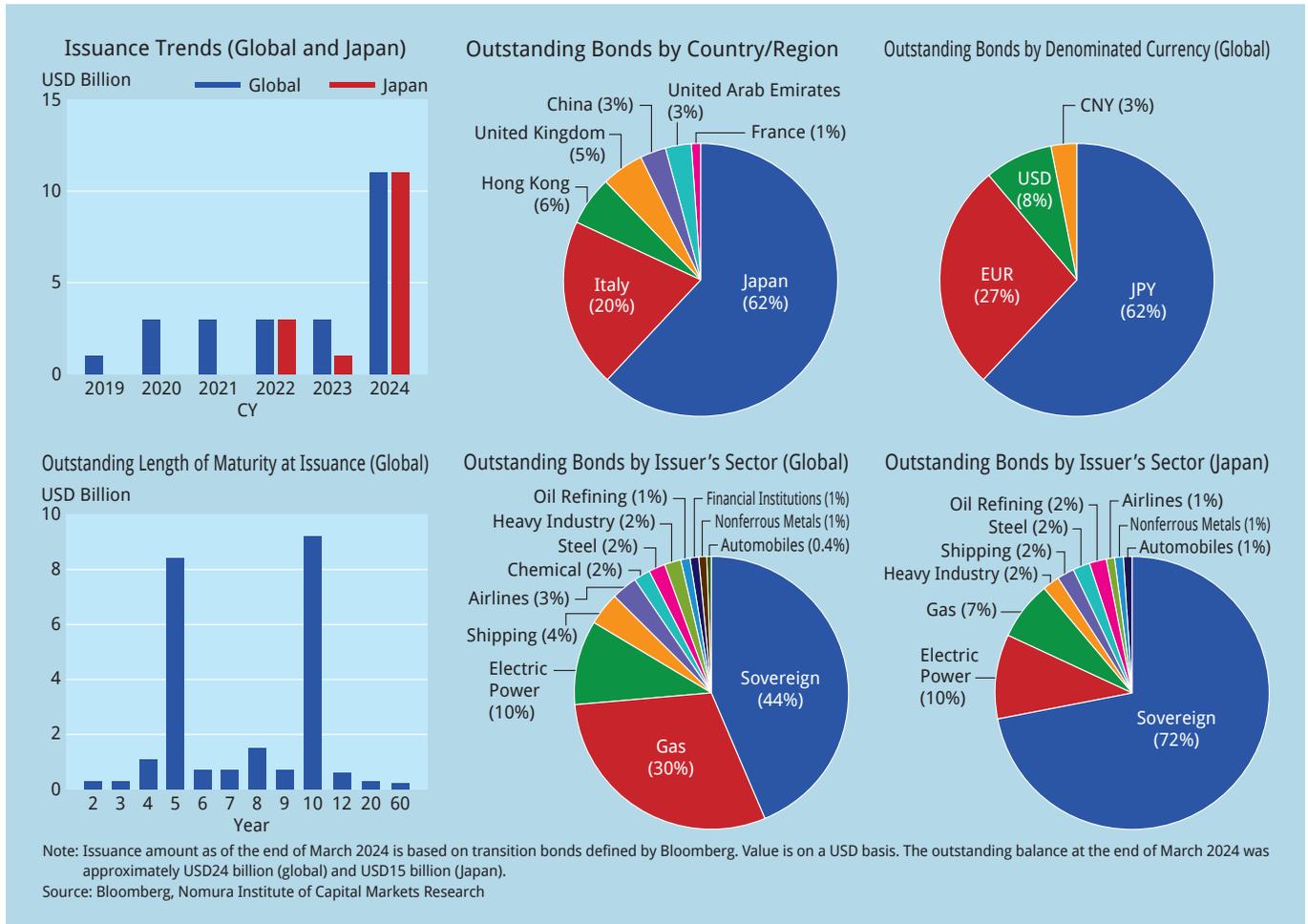
ulate demand for investment in and financing of transition finance projects. The BOJ's Climate Response Financing Operations provide long-term funds at 0%¹ interest to financial institutions that invest in and lend to climate-change related projects, including projects qualifying for transition finance.

In February 2024 the Japanese government issued the world's first sovereign climate transition bonds, under its GX Economy Transition Bond program. The bonds issued in February were climate transition interest-bearing government bonds (JGBs)² with a total issuance amount of approximately JPY1.6 trillion. The Japanese government plans to issue a total of JPY20 trillion worth of GX economy transition bonds over the ten years from FY2023 to support upfront investment in the promotion of its green transformation. Use of proceeds is to support the development of innovative technologies and capital investment that will contribute to the decarbonization of energy and raw materials and enhance the profitability of companies.

Current State of Transition Bond Issuance

Transition bonds have been issued around the world since 2017. The first issuance in Japan was in July 2021, and since then the number of Japanese issuers and total issuance amount have increased steadily. The Japanese government's first sovereign climate transition bond issued in February 2024 increased the outstanding issuance of transition bonds by Japanese issuers as of the end of March 2024 to USD15 billion, accounting for about 62% of total global issuance (USD24 billion, Figure 1). With the issuance of its first climate transition bond, the Japanese government is now the

Figure 1: Issuance of Transition Bonds



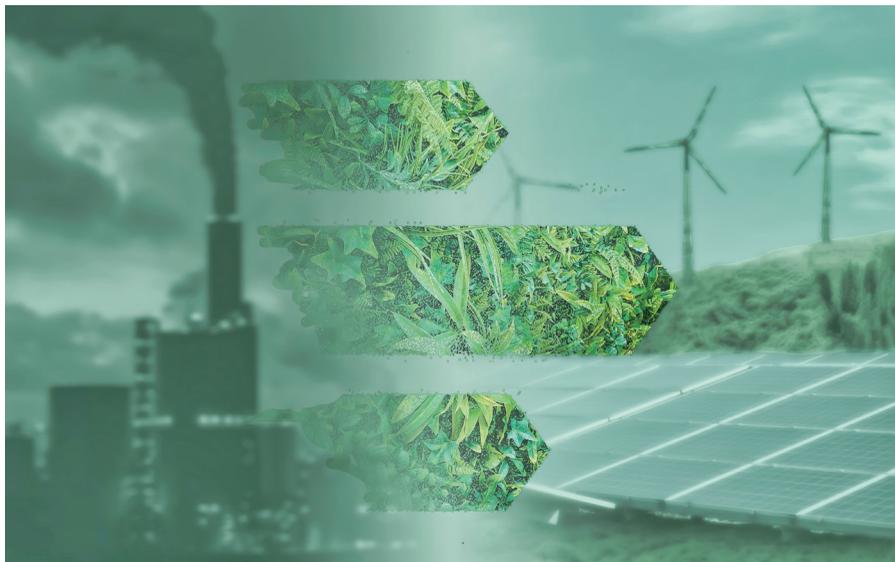
largest issuer of transition bonds in Japan. However, other major issuers include companies in industries with relatively large GHG emission levels, including electric power, gas, and oil refining.

Issuance of transition bonds in countries and regions other than Japan, however, has not expanded steadily. The main reason seems to be the ICMA's CTFH is simply a guideline for disclosures when implementing transition finance and does not provide information on the eligibility of projects, unlike the Green Bond Principles (GBP). For this reason, financing that expresses the transition strategy of issuers outside Japan tends to be conducted through sustainability-linked bonds (SLB), which are already widespread in financial markets and designed as general-purpose corporate instruments. As of the end of March 2024, transition bonds have a shorter history than green bonds and other sustainable finance debt instruments, and their total issuance to date is smaller. The number of countries, regions, and industries represented by transition bond issuers is also limited. However, in the near future, with the support of various promotional measures, the issuance of transition bonds may increase and become more widespread.

Challenges for Realizing a Decarbonized Society

In Japan, transition finance has increased steadily, thanks in part to the government's multi-layered measures promoting its use for financing the transition to a decarbonized society. As a result, Japan has established a presence as a global leader in transition finance. That said, Japan needs to address three main issues to ensure its use of transition finance contributes to the realization of a decarbonized society.

First, Japan needs to make efforts to create a positive image of transition finance in international financial markets. Many countries have a negative image of transition finance due to concerns that it may extend the life of industries with high GHG emissions. In order to dispel this negative image, it is important to show the validity of the transition strategy. Furthermore, it is needed to take measures such as enhanc-



ing information disclosure by issuers and continuing to explain, through dialogue with investors and other stakeholders, that transition finance truly contributes to the transition to a decarbonized society and to gaining credibility in international financial markets.

Second is the need for greater international cooperation. Many countries are implementing measures to increase the credibility and transparency of transition finance. In particular, the Association of Southeast Asian Nations (ASEAN), which needs to use transition finance to move to a decarbonized society, has followed the European Union (EU) and created a classification for transition activities in its ASEAN Taxonomy for Sustainable Finance. Although Japan has not formulated such a taxonomy, it may be meaningful for Japan to cooperate with other countries' systems in order to spread the use of transition finance globally.

Third, Japan needs to promote measures to ensure the smooth acceptance of its climate transition government bonds by financial markets. Climate transition government bonds account for the largest share of Japan's transition bond market and therefore may have a significant impact on financial markets as a whole. Therefore, the Japanese government needs to make constant efforts to ensure its bonds are smoothly adopted by investors, including efforts to improve the reliability of impact reporting through external audit/verification. Furthermore, it may need to consider expanding the investor base by issuing climate transition bonds to individual investors as well as institutional investors.

Notes

- 1 The interest rate was revised from 0% to 0.1% in March 2024.
- 2 GX Economy Transition Bonds are a type of Japanese government bond to be redeemed by FY2050 using fossil fuel levies and specific business operator contributions. GX Economic Transition Bonds can be issued separately under the name CT government bonds. Another option is to issue them as ordinary government bonds.

AKANE ENATSU

Head of Nomura Research Center of Sustainability (NRCS) and Managing Director, Nomura Institute of Capital Markets Research (NICMR)

Akane Enatsu is Managing Director of Nomura Institute of Capital Markets Research (NICMR). She joined NICMR in 2012 and was appointed Head of Nomura Research Center of Sustainability (NRCS) in 2019. Her main research coverage includes public finance and sustainable finance. She has published several books including the *Municipal Bond Investment Handbook and ESG/SDGs Keywords 130*. She also serves several government organizations as a panel member.

Prior to joining NICMR, Enatsu was a credit research analyst for various financial institutions including Citigroup, Barclays, and Merrill Lynch. She earned an MBA from University of Oxford and a PhD in Economics from Saitama University.



SUK HYUN

Yonsei University

Status and Challenges of Sustainable Finance in Korea: Environment and Finance

ESG Policies and Sustainability Efforts in Korea

The mounting sustainability crisis, encompassing climate change, ecosystem degradation, extreme inequality, and social polarization, has prompted a heightened focus on environmental, social, and governance (ESG) concerns. In order to address the aforementioned sustainability crises, it is imperative that financial markets assume a more pivotal role. In response to these challenges, Korea has acknowledged the significance of ESG and has implemented a range of policies that reflect this.

In December 2021, the Ministry of Trade, Industry and Energy released the K-ESG Guidelines, which provide guidance on the introduction and establishment of ESG management in domestic companies. The guidelines are designed to assist companies in evaluating their ESG performance by providing transparent and comprehensive criteria, including environmental indicators such as environmental mark certification, compliance with environmental laws and regulations, greenhouse gas emissions, waste and pollutant generation, recycling rate, and so forth. Furthermore,

on December 7, 2022, the Ministry of Trade, Industry and Energy released the K-ESG Guidelines for Supply Chain Due Diligence in response to the development of supply chain due diligence laws in major countries and the expansion of global ESG initiatives. In 2023, the Ministry of Trade, Industry and Energy provided K-ESG Guidelines for four domestic industrial sectors (steel, automobile, petrochemical, and semiconductor) that met global standards in the context of advanced ESG disclosure standards and assessments, as well as the emergence of industry-specific ESG indicators.

In December 2021, the Ministry of Environment (MOE) announced the Korean Green Classification System (K-Taxonomy) in accordance with the Environmental Technology and Environmental Industry Support Act. The K-Taxonomy provides principles and standards for economic activities that contribute to environmental goals such as greenhouse gas reduction and climate change adaptation. It is organized into two categories: the “green sector” and the “transition sector.” The Green Sector encompasses 64 economic activities that are essential for achieving carbon neutrality and environmental improvement, including renewable energy. The Transition Sector includes five economic activities that are working towards becoming carbon neutral, such as liquefied natural gas (LNG) power generation. In December 2022, the MOE announced the revised K-Taxonomy, which includes the nuclear economic activity sector, in line with the European Union

(EU) Taxonomy enacted in July of the same year. In 2024, the K-Taxonomy will undergo a partial revision with the objective of targeting four environmental goals (water, circular economy, pollution prevention, and biodiversity). Concurrently, the K-Taxonomy will be gradually expanded to include not only green bonds but also credit, stocks, and funds. Furthermore, a green classification system for credit products will be prepared in consultation with the Financial Services Commission and the Financial Supervisory Service.

These endeavors are designed to elevate the national discourse on ESG-related matters and to prompt companies to prioritize these concerns. This represents a transformation in the investor mindset, moving beyond a narrow focus on financial returns. Investors are recognizing that a company’s environmental awareness and robust governance are essential for ensuring its long-term viability.

Key ESG Regulators and ESG Disclosures

The primary regulatory bodies over ESG matters include the Financial Services

Commission, the Financial Supervisory Service, the Korea Exchange, and the MOE. The Financial Services Commission is responsible for regulating the financial industry and financial policies related to ESG finance and disclosure. In contrast, the Korea Exchange places a strong emphasis on corporate responsibility for ESG issues, establishing regulations and disclosure standards for listed companies. In particular, on January 18, 2021, the Financial Services Commission and the Korea Exchange released ESG disclosure guidelines.

The guidelines encourage companies to make voluntary ESG disclosures until 2025, after which mandatory disclosures will be phased in for companies listed on the Korea Composite Stock Price Index (KOSPI) Market with total assets of more than KRW2 trillion.¹ Furthermore, all companies listed on the KOSPI will be required to make disclosures starting in 2030. To establish an ESG supervisory system, the Financial Supervisory Service is implementing measures such as reviewing domestic disclosure standards, setting ESG bond evaluation standards, preparing disclosure proposals for evaluation reports, strengthening screening of investment strategies such as ESG fund portfolio composition, and conducting post-inspection. Additionally, the Service is planning to establish supervisory standards for the sale of ESG financial products and establish a financial product disclosure system.

The MOE is implementing system improvements, including the transition from a linear to a circular economy, with the goal of achieving carbon neutrality by 2050. On March 24, 2021, the MOE amended the Environmental Technology and Environmental Industry Support Act to enhance environmental disclosure by companies. Previously, only certain companies were required to disclose information; however, with this amendment, the obligation to disclose has been extended to listed companies with total assets exceeding KRW2 trillion. This reflects a growing trend of strengthening disclosure obligations related to environmental impact management.

The authors' research, which utilized ESG disclosure data for domestic companies from 2011 to 2020, demonstrated that the presence of foreign investors and national pension funds as major shareholders was associated with a statistically significant increase in general ESG disclosure rates.² Nevertheless, there is no statistically significant effect on the rate of ESG disclosure based on materiality. This can be interpreted as the absence of a unified

disclosure standard for ESG, which allows companies to focus their voluntary disclosures to large institutional investors such as foreign investors and national pension funds on general ESG information rather than material ESG information. Consequently, investors are increasingly demanding clear standards and regulations for ESG disclosure, and various domestic and international organizations are working to respond. This is part of a global trend towards sustainable management and socially responsible business practices.

On June 26, 2023, the International Sustainability Standards Board (ISSB) released its inaugural set of standards on sustainability disclosures. These standards, collectively titled International Financial Reporting Standards (IFRS) S1 'General Requirements for Disclosures of Sustainability-related Financial Information' and IFRS S2 'Climate-related Disclosures', represent a significant advancement in the field of sustainability reporting. In Korea, on April 30, 2024, the Korea Sustainability Standards Board (KSSB) released a draft of domestic sustainability disclosure standards that are intended to be interoperable with ISSB disclosure standards and those in the EU and United States (US). The disclosure draft comprises mandatory disclosure standards for companies, general disclosures for sustainability-related financial information (No. 1), climate-related disclosures (No. 2), and optional additional disclosures that consider policy objectives among sustainability-related issues (No. 101).

The Current State of the ESG Ratings Market

The current state of the ESG assessment market is a complex landscape, comprising a number of challenges. The most significant challenge is the lack of uniformity in ESG assessments, which is crucial for attaining environmental and social objectives and reinforcing investor confidence. The opacity of ESG ratings is also evident in the 2022 report from the Korea Institute of Corporate Governance and Sustainability, which demonstrated a decline in the ESG ratings of Korean companies. Specifically, the number of A+-rated companies

decreased, while the number of D-rated companies increased year-on-year. It is imperative that policy efforts be undertaken to enhance the transparency and credibility of domestic ESG raters. This is necessary to ensure that Korean companies are not penalized by ESG ratings, given that they have fewer opportunities to receive feedback from raters and the methodology is not disclosed. It is similarly important to facilitate communication between companies and rating agencies.

Moreover, a report by the Korea Institute for International Economic Policy (KIEP) indicates that Korean companies' ESG scores in the Governance category are below the global average.³ This indicates that Korean companies must enhance their comprehension of ESG matters and integrate them into their business strategies. Moreover, it is crucial to prioritize the enhancement of corporate governance. To bridge the gap between theory and practice, companies should adopt a transparent approach to disclosing ESG information and provide active feedback on their performance.

The market for ESG ratings presents a challenge for investors and stakeholders due to the diversity of methodologies and metrics employed by different rating agencies. Consequently, companies frequently encounter difficulties in comprehending their ratings and in identifying avenues for enhancing their ESG measurement. In response to these challenges, the Financial Services Commission established the ESG Rating Agency Guidelines in May 2023. In order to overcome the challenges currently facing the ESG rating market, it is necessary to make efforts to establish and maintain transparent corporate governance, improve ESG disclosure, and develop standardized ESG rating systems.

Sustainable Capital Markets: K-Taxonomy and Green Bonds

The sustainable finance market in Korea is demonstrating remarkable growth across all sectors. In particular, investments in ESG factors are expanding rapidly, especially among institutional investors. Their investment balances have increased significantly, from KRW26 trillion in 2017 to

KRW212 trillion in 2021. The National Pension Service, a major investor, has contributed to this growth. On the other hand, the issuance amount of social bonds increased to KRW86 trillion in 2021, accounting for 71.1% of the total. This indicates that the domestic ESG bond market is relatively lacking in the diversity of eco-friendly social projects. Consequently, it is imperative to address this imbalance and ensure the establishment of a more balanced and diverse portfolio of ESG projects.

In general, sustainable financial instruments are employed to invest in environmental protection and social issues. Domestic green bond issuers are required to adhere to specific issuance procedures and guidelines, including external review, in order to prevent the possibility of “greenwashing.” As the domestic and international green bond markets have grown rapidly in recent years, measures to prevent greenwashing and improve the quality of external review reports are needed to enhance the credibility of green bonds. In this regard, K-Taxonomy can play an important role. Those industries that have been recognized for their green economic activities will be able to secure more funding, while institutions issuing green bonds will be able to gain investor confidence through K-Taxonomy. Furthermore, the December 2022 revision of the Green Bond Guidelines included the introduction of a process to determine eligibility for K-Taxonomy, the implementation of a registration system for external rating agencies, and the establishment of a green bond follow-up (monitoring) system.

The author’s research indicates that data from the domestic green bond issuance market from 2018 to 2022 was analyzed. This analysis revealed that the amount of environmental information included in the external assurance report affects the interest rate of green bonds.⁴ In practice, the verification standards of green bond external verifiers vary considerably and lack objectivity and consistency. Consequently, the provision of a certain level of information (exceeding 22-23 pages of the report) by the external verification process has the effect of lowering the interest rate of green bonds. This implies that companies may be able to reduce the cost of financing green projects if the external reviewer’s report provides sufficient information to investors. These findings demonstrate the pivotal role of sustainable capital markets, K-Taxonomy, and green bonds in fostering sustainable finance and investment in Korea.

Future Challenges

As has been demonstrated, the prospective ESG challenges are numerous and necessitate a comprehensive approach for their resolution. This includes the continued development of infrastructure related to ESG, improved disclosure, improved methodologies, and enhanced impact assessment. It is similarly vital to sustain investor interest and confidence in ESG investing, as well as companies’ dedication to objective and reliable ESG information disclosure.

Moreover, international initiatives such as RE100 (100% Renewable Energy) and ESG standards may not be fully compatible with the energy-intensive, manufacturing-driven economies of certain countries. For instance, in a country like Korea, which is heavily reliant on fossil fuel-powered electricity generation, it is challenging to construct new manufacturing facilities without significant technological advancement. Consequently, it is imperative to develop evaluation and disclosure standards that are tailored to the local context, rather than adopting directly European and US-led ESG standards.

In conclusion, the aforementioned challenges must be addressed in a systematic and logical manner, taking into account the unique circumstances and requirements of each country and industry. It is therefore to be expected that ESG investments will grow, and that sustainable growth and development will be achieved.

Notes

- 1 The Financial Services Commission has announced that it will postpone the mandatory disclosure of ESG information from 2025 to 2026.
- 2 Hyun et al. (2023), “Exploring the Impact of Information Environment on ESG Disclosure Behavior: Evidence from National Pensions and Foreign Investors,” 2023 Korean Accounting Association Summer International Conference.
- 3 Korea Institute for International Economic Policy (2022), “The reality and implications

of ESG performance assessment in major countries,” *World Economy Today*.

- 4 Hyun et al. (2023), “Price Implications of Greenwashing: Evidence from Korean Green Bond Markets,” Working Paper.



SUK HYUN

Head, Graduate School of Environmental Finance, Yonsei University

Professor Suk Hyun is the head of the Graduate School of Environmental Finance at Yonsei University. Prior to joining EastAsia International College (EIC) of Yonsei in 2018, he served as a visiting scholar in the Department of Economics at the University of Southern California and was a research fellow at the Korea Capital Market Institute (KCMI). From 2009 to 2010, he served as an economist at the Bank of Korea. From 2006 to 2009, he was a bond market specialist at the Japan Bank for International Cooperation (JBIC), where he led the Asian Bond Markets Initiative (ABMI) Task Force.

His expertise encompasses international finance, bond markets, and the Japanese economy. His recent research interests include green digital finance, infrastructure bonds, green bonds, capital market development, and financial integration in Asia.

Professor Hyun holds a Bachelor of Arts in Economics from Yonsei University and both a master’s and PhD in economics from Keio University.



**GUAN SENG
KHOO**

Singapore Economic Forum



ANNIE KOH

Singapore Management University

Enhancing Transition Finance via Blended Finance: A Landscape Review

Introduction

Transition finance (TF) is the financing of the transition to a low-carbon, climate-resilient economy and in this era, it plays a crucial role in driving sustainable development and addressing climate change. For instance, TF focuses on supporting companies in adopting more sustainable business models and practices. It also involves financing projects that contribute to environmental and social progress while maintaining financial viability. Hence, it can be used to finance a wide range of activities, including:

- Investing in renewable energy and other clean technologies
- Developing and deploying new climate-friendly products and services
- Retrofitting existing infrastructure to make it more efficient and sustainable
- Helping businesses and households to transition to a lower-carbon lifestyle, etc.

This article identifies and discusses the:

- Challenges and Opportunities of TF
- What we have learned in the Singapore context
- Examples of promising results from Blended Finance
- Conclusion on the importance of Public-Private-People partnerships to address climate related risks.

Challenges in TF

TF is essential to achieve the goals of the 2015 United Nations (UN) Paris Agreement, which aims to limit global warming to well below 2 degrees Celsius above pre-industrial levels. However, there are several challenges that need to be addressed first in order to scale up TF, as illustrated in Table 1.

Despite these challenges, TF is potentially a growing market with significant opportunities for investors and other mar-

ket participants. The global transition to a low-carbon economy is expected to generate trillions of dollars in investment opportunities over the next couple of decades.^{1,2,3} Effective TF, though, requires the integration of Environmental, Social and Governance (ESG) factors into investment decisions. This ensures that investable projects align with ESG criteria, driving positive impact alongside financial returns.

Addressing These Challenges

For TF to take off, there are a few ways to address some of the challenges above, namely:

- Developing a common definition of TF: This would improve transparency and comparability of TF products and services.
- Improving data and disclosure: Financial institutions (FIs) and other market participants are encouraged to disclose more information about their climate performance and their exposure to climate risks. This

Table 1: Challenges in TF

Lack of a Common Definition	There is currently no universally accepted definition of TF. This makes it difficult for investors and other market participants to identify and assess TF finance opportunities.
Data and Disclosure Gaps	There is a lack of comprehensive and reliable data on the climate performance of companies and other borrowers. This makes it difficult for investors to assess the risks and opportunities associated with TF investments.
High Transaction Costs	The costs of developing and structuring TF transactions can be high. This is particularly true for smaller and less experienced companies, emerging markets and investors.
Limited Market Liquidity	The market for TF instruments is still relatively new and illiquid. This can make it difficult for investors to buy and sell these instruments when they want to.
Regulatory Uncertainty	There is some regulatory uncertainty around TF. This can make it difficult for financial institutions to develop and offer TF products and services.
Risk of Greenwashing	There is a risk that some companies and investors may use TF to “greenwash” their activities, i.e., to make them appear more climate-friendly than they are actually. This can undermine the credibility of the TF market.

Source: Transition Finance: New Opportunities and Challenges for Financial Institutions. Baker McKenzie, 2023; Three Key Challenges in Transition Finance. Organisation for Economic Co-operation and Development (OECD) iLibrary, 2023; Transition Finance: Challenges and Opportunities. World Economic Forum, 2022

would help investors to make more informed decisions about TF investments.

- Reducing transaction costs: Governments and FIs can work together to reduce the transaction costs associated with TF projects, perhaps through a blended finance or small-scale and mini- or small-scale public-private partnership (mini-PPP) approach. This would make TF more accessible and palatable to smaller and less experienced companies and investors by reducing the investment risks at various stages of the lifecycle of the projects, for example.
- Increasing market liquidity: Governments and FIs can work together to increase the liquidity of the market for TF instruments. This would make it easier for investors to buy and sell these instruments when they want or need to.
- Reducing regulatory uncertainty: Governments should provide clear and predictable regulatory guidance on TF. This would incentivise FIs to develop and offer TF products and services.
- Addressing the risk of greenwashing: Governments and regulators should develop mechanisms to prevent greenwashing in the TF market. This would help to maintain the credibility of the market.

Opportunities in TF

Despite the challenges it faces, TF is a growing market with significant opportunities for investors and other market participants. While TF presents opportunities for sustainable growth, it also faces challenges such as measurement and reporting of impact and the misplaced perception that it must involve the financing of megaprojects. Overcoming these obstacles can lead to significant positive environmental and social outcomes. In addition, the global transition to a low-carbon economy is expected to generate trillions of dollars in investment opportunities over the coming decades.

Here are some of the key opportunities of TF:

- Investment in new technologies: TF can be used to invest in the development and deployment of new clean technologies, such as renewable energy, energy storage, and electric vehicles. These technologies are essential for reducing greenhouse gas emissions and achieving the goals of the Paris Agreement.

- Retrofitting existing infrastructure: TF can be used to retrofit existing infrastructure, such as buildings and transportation systems, to make them more efficient and sustainable. This can help to reduce energy consumption and greenhouse gas emissions.
- Helping businesses and households to transition: TF can also be used to help businesses and households transition to lower-carbon emissions. This can include financing investments in energy efficiency measures, renewable energy systems, and electric vehicles.

FIs could grow their green asset base while catalyzing TF through issuing green bonds and investing the proceeds in climate solutions and sustainable companies and address the transition assets, thus recognizing their importance in the net zero pathway. Furthermore, retail and institutional investors could also subscribe to these green bonds thus widening the investor base, indirectly enhancing blended finance with the diversified investor base.

In addition, FIs could still purchase higher emissions investments, but through their stakeholder engagement approach and efforts, help the owners of these brown assets to decarbonize faster than planned and that is an important pathway towards net zero.

With so much focus on emissions reduction, the easiest way to meet a target is to just sell an asset. But, for true TF, the sale of an asset may not reduce emissions

immediately because it might involve taking on a high-emission investment which would be taken down intentionally in future years. Most importantly, these transition efforts would lead to real-world emission reductions.

In addition to these specific measures, it is also important to create a supportive environment for TF to succeed or catalyse TF activities. These include:

- Raising awareness of TF: Governments, FIs, and other stakeholders should work together to raise awareness of TF among investors and other market participants.
- Building capacity: Governments and FIs should provide training and support to help market participants to develop the skills and knowledge they need to engage in TF.
- Promoting collaboration: Governments, FIs, and other stakeholders should work together to promote collaboration and knowledge-sharing on TF and to finance prototype smaller-scale projects which have the potential to expand, making such financing more palatable for other investors.

TF in Singapore

In Singapore, the Monetary Authority of Singapore (MAS)⁴⁵ has adopted a few plans to support TF. These include:

- Developing a regulatory framework for TF: MAS is working to develop a regulatory framework that will support the development and deployment of TF products and services. This framework will set clear expectations for FIs on how to manage climate risks and support their customers in the transition to a low-carbon economy.
- Promoting innovation in TF: MAS is working to promote innovation in TF by supporting the development

of new TF products and services, and by creating a sandbox environment where FIs can test and deploy new innovations.

- Building capacity in TF: MAS is working to build capacity in TF by providing training and support to FIs and other stakeholders. This will help them to develop the skills and knowledge they need to engage in TF.
- Promoting collaboration on TF: MAS is working to promote collaboration on TF between FIs, governments, and other stakeholders. This will help to accelerate the development and deployment of TF products and services including transition credits.

In addition to these plans, MAS is also working to support TF through its own investments and operations. For example, MAS has committed to aligning its own portfolio with net zero greenhouse gas emissions by 2050. MAS is also working to reduce the environmental impact of its own operations.

By supporting the development and deployment of TF, MAS can help to accelerate the transition to a low-carbon economy and create a more sustainable future for Singapore. Further details can be found on MAS website.

In addition, Singapore is introducing new measures and enhancing existing ones to help businesses decarbonise and strengthen sustainability capabilities. They include:

1. The Energy Efficiency Grant (EEG), first launched in 2022, that co-funds businesses in energy-efficient equipment will be expanded to more sectors, including manufacturing, construction, maritime, and data centres and their users.
2. Enterprise Singapore (EnterpriseSG) will extend the Enterprise Financing Scheme-Green (EFS-Green) by two years, to support Singapore enterprises embarking on their sustainability journey. The scheme will enable better access to green financing for Singapore companies that develop green technologies and solutions.
3. Singapore Economic Development Board (EDB) will enhance the Resource Efficiency Grant for Emissions (REG[E]) by lowering the car-

bon abatement threshold from 500 tonnes per annum to 250 tonnes per annum, allowing more industrial facilities to access to the grant to undertake projects that improve their energy efficiency and reduce carbon emissions.

4. EDB and EnterpriseSG will launch a Sustainability Reporting Grant to support companies on their sustainability performance reporting journey. This is in view of increasing demand for companies to publish climate-related disclosures. Further details will be shared later this year.

Promoting TF in the ASEAN Region and Beyond via Blended Finance^{6,7,8,9,10}

Around the region of southeast Asia, blended finance has also been proposed as a form of capital to actualize climate transition in emerging and developing economies. Innovative instruments and equity finance are needed to enhance risk-sharing through mini-PPP projects.¹¹ These smaller (in terms of funding) projects serve to reduce the risk of the projects being financed and make them more palatable to the risk appetite of private sector investors, including family offices and philanthropies, while at the same time, maximizing the impact of scarce public funds, e.g., in financing solar micro-grids, etc.¹²

As emerging market and developing economies account for two-thirds of global greenhouse gas (GHG) emissions, and many are highly vulnerable to climate hazards, these economies will need significant financing in the coming years to reduce emissions and adapt to the physical effects of climate change.

Many of these economies also have high debt and constrained budgets because of the pandemic and face higher government borrowing costs amid rising global interest rates, making it especially challenging for public finance to meet pressing climate financing needs. Given the current weak outlook for growth, and constraints on the public purse, especially in developing economies and countries where climate change is likely to have the greatest impact, increasing the number of private

investments in these regions is an urgent priority.

Mobilizing private capital on a large scale will be key to achieving developing countries' climate objectives. Financial markets alone cannot do the job, but combining public and private capital offers unique advantages by reducing investment risk and attracting greater funding. Multilateral development banks and international FIs can provide support through creating blended financing structures to alter the risk-return profile for the climate transition in emerging economies, e.g., distributed green solar micro-grids or small-scale PPP investments.

Regarding the promotion of TF markets, there are several ways that governments, FIs and Non-FIs like philanthropies and family offices can work together to reduce the transaction costs and increase the market liquidity associated with TF transactions through blended finance or scalable mini-PPP approaches similar to what the Daya Selaras Group in Indonesia has done to enhance and finance circular businesses in the informal waste sector, etc.¹³

Blended finance is a type of financing that uses a combination of public and private capital to support sustainable development projects and businesses. Blended finance structures typically combine concessional financing (such as grants and loans with low interest rates) with commercial financing (such as equity and debt investments).

Hence, blended finance can be used to support a wide range of TF projects, for example,;

- Finance the early stages of development of new clean or sustainable resource technologies and ecosystems such as Innovate 360's achievement with a platform for nurturing sustainable food startups¹⁴
- Support the construction of renewable energy projects in emerging markets (EMs)
- Help businesses to adopt energy and process efficiency measures including building up the operational and business resilience of the operating companies with government support as in the case of Mewah International¹⁵
- Provide financing for climate and environment proofing projects

Specifically, blended finance is being used to support TF in the following ways:

- The Green Climate Fund (GCF) has a few blended finance programs that support climate action in developing countries. For example, the GCF's Private Sector Facility provides blended finance to support private sector investment in climate-friendly projects.
- The World Bank's Climate Investment Funds (CIFs) are a group of five funds that support climate action in developing countries. The CIFs use blended finance to support a wide range of climate projects, including TF projects.
- The Global Innovation Fund (GIF) is a blended finance fund that invests in early-stage clean technology companies. The GIF provides concessional financing to help these companies to develop and deploy their technologies.

Case Study 1: H2 Green Steel

H2 Green Steel is a Swedish company developing what would be the world's first large-scale green steel plant.¹⁶

Steelmaking, essential for building everything from bridges to utility-scale solar arrays, is one of the most carbon-intensive processes on the planet. It accounts for somewhere between 7 and 9 percent of global carbon emissions. The sector relies heavily on coal-fired blast furnaces and is notoriously tough to de-carbonise.

One potential path to removing fossil fuels from the process of making steel is to use clean hydrogen instead of coal. But this approach has not yet been demonstrated at an industrial scale.

H2 Green Steel aims for a different path with its in-progress facility in Boden, in northern Sweden. According to the company, construction of the green steel plant is now well underway, and it has locked down supply contracts, electricity power-purchase agreements and, most importantly, binding custom-

er agreements for "half of the initial yearly volumes of 2.5 million tonnes of near zero steel."

If construction goes as planned, the facility will begin churning out green steel by the end of 2025 or early 2026.

The firm recently announced that it has achieved a "massive milestone," finalizing a 4.75-billion-euro investment. The mostly debt financing comes just months after the firm announced a EUR1.5 billion equity round. The debt portion of the financing, amounting to EUR4 billion, comes from a group of more than 20 lenders that includes government entities such as the European Investment Bank and major banks such as BNP Paribas. H2 also added nearly EUR300 million in new equity funding from a group of both new investors, like Microsoft Climate Innovation Fund, and existing shareholders, such as Just Climate. The company signed a EUR250 million grant agreement with the European Commission's Innovation Fund as well.

Total funding for the facility is now EUR6.5 billion, a significant sum for a novel project.

"The sheer size and innovative structuring of the financing package matches the scale and complexity of this landmark project," Shraavan Bhat, a senior associate with RMI's Center for Climate-Aligned Finance, said. "The way H2 Green Steel has raised and de-risked this first-of-its-kind financing is a template for others to study."

The private equity firm behind the H2 project, Vargas Holding, has managed to pull together this much money in large part because it has already locked in a few credible customers for green steel. In 2022, the firm announced preorders from blue-chip companies like BMW and Mercedes-Benz as well as from primary steel suppliers like Bilstein Group. The Swedish National Debt Office has also agreed to provide a "green credit guarantee" to backstop billions of dollars of debt financing.

“If I’m a banker giving money for this first-of-a-kind thing, if anything goes wrong, the Swedish government is on the hook—and I have confidence that they will repay,” Bhat told Canary Media, an independent affiliate of RMI, in September.

This assurance, together with the array of buyers H2 Green Steel has lined up, has likely eased investor concerns about the risks of the project’s unproven approach. Such an approach to reducing risk will help transform and promote TF to a higher level.

In addition to pioneering a new way to produce steel at an industrial scale, the firm is also planning to secure access to clean hydrogen by building out an unprecedented number of electrolyzers, the machines used to produce carbon-free hydrogen from water and electricity. The facility’s 700 megawatts-electrolyser capacity is a major undertaking in itself, representing one of Europe’s largest clean hydrogen commitments to date.

In the case of EMs, however, foreign private investment will be essential for them to achieve net zero objectives, especially in countries with small domestic investor bases and limited fiscal capacity. There is significant potential for EMs to attract green investment, at a time when sustainable investing is on the increase. Capital markets, and in particular investment funds, can play an important role in financing the green transition in EMs.

One recent example from the ASEAN region is Gunung Raja Paksi (GRP), Indonesia.^{17,18}

Case Study 2: Gunung Raja Paksi—Decarbonising a Steel Company

GRP was listed in 2019, undergoing significant management changes (with family members transferring control to a professional team), while embracing digital transformation and sustainability. It recently signed a Memorandum of Understanding (MOU) with the European group, SMS Group, to drive green steel development initiatives in Indonesia. This MOU is partly

a result of significant investment by Japanese (Yamato Kogyo) and Thai (Siam Yamato Steel) partners, and a testament to the success of the group’s transformation. In addition, a member of Gunung Steel Group and one of the largest private steelmakers in Indonesia, has become the first steelmaker in the country to secure a USD2 million sustainability-linked loan from Bank Negara Indonesia (BNI, the national bank). The five-year bilateral credit would be used to fund GRP’s sustainability initiatives, which include the recently commissioned Light Section Mill (LSM).

While EMs face sizeable opportunities to leverage global capital markets, they will need to manage potential risk associated with the growth of green finance. Geographic rebalancing of portfolios - due to regulations, benchmarking, geopolitics or investor preferences - towards countries with lower climate risk or better green investment opportunities, and away from riskier countries or countries with larger fossil fuel sectors, may affect capital flows.

At present, in several EM regions, a large proportion of catalytic capital is provided by Development FIs (DFIs), governments and Non-Governmental Organisations (NGOs) with specific targeted missions, e.g., removing plastic waste, etc. Family offices could be the catalyst that ESG investing needs, e.g., local foundations and family businesses could initiate and incubate green pioneering initiatives to decarbonise their operations across business lifecycles with the aim to attract more private capital by reducing the risk in these projects early upstream based on, say, achieving impact milestones at earlier stages. If these new private investors can insert themselves into that capital flow and pick up a few basis points, that’s a lot of potential returns with less risk as illustrated by some earlier case studies.¹⁹

Examples of how blended finance at the macro-level can be used to promote TF are discussed briefly below:

- To provide concessional financing to cover the costs of developing and structuring TF transactions and attract private capital: This can help to make TF more accessible to companies and other borrowers, particularly in developing countries.

- To support the development of new TF products and services: Blended finance can be used to provide risk capital and technical assistance to financial institutions to help them develop new TF products and services.
- To scale up existing TF initiatives: Blended finance can be used to scale up existing TF initiatives by providing additional financing and support as well as technical assistance to help companies and other borrowers to prepare and submit TF proposals. This assistance could include help with developing financial projections, identifying potential investors, and structuring transactions.

Overall, blended finance is a powerful tool that can be used to promote TF and accelerate the transition to a low-carbon economy. These are just a few examples of how blended finance is being used to support TF. As the transition to a low-carbon economy accelerates, we can expect to see even more investment in TF projects through blended finance structures.

Governments and FIs can also work together to create and operate platforms that streamline the process of developing and structuring TF transactions, through incubators, accelerators and sustainability funds. These platforms could provide companies and other borrowers with access to information on potential investors, financing sources, and transaction templates.

Concluding Remarks

In summary, addressing the challenges and creating a supportive environment can accelerate the transition to a low-carbon, climate-resilient economy. Even at the time of writing this article, transition credits and just transition²⁰ are gaining traction in incentivizing positive change and accelerating the shift towards a more sustainable and resilient future.

Finally, governments and FIs can continue to work together to develop risk-sharing mechanisms that can help to reduce the risk of TF transactions for investors. This could include mechanisms such

as partial guarantees and credit enhancements to make TF more accessible to companies and other borrowers, accelerating the transition to a low-carbon economy. This article should encourage a movement towards public-private partnerships to build a better world for all.

Notes

- 1 Transition Finance: New Opportunities and Challenges for Financial Institutions. Baker McKenzie, 2023.
- 2 3 Key Challenges in Transition Finance. OECD iLibrary, 2023.
- 3 Transition Finance: Challenges and Opportunities. World Economic Forum, 2022.
- 4 www.mas.gov.sg/publications/consultations/2023/consultation-paper-on-proposed-guidelines-on-transition-planning-for-asset-managers#:~:text=This%20consultation%20sets%20out%20MAS,physical%20effects%20of%20climate%20change.&text=This%20consultation%20closes%20at%2011.59%20PM%20on%2018%20December%202023
- 5 www.mas.gov.sg/news/media-releases/2023/mas-proposes-guidelines-for-financial-institutions-on-transition-planning#:~:text=Regulators%20must%20support%20financial%20institutions.proposals%20by%2018%20December%202023.
- 6 Blended Finance for Transition Finance: A practical guide. International Finance Corporation, 2023.
- 7 Promoting Transition Finance through Blended Finance: A review of existing initiatives and lessons learned. World Resources Institute, 2022.
- 8 The Role of Blended Finance in Promoting Transition Finance in Developing Countries. Climate Policy, 2021.
- 9 Blended Finance for Transition Finance: An overview of the potential and challenges. OECD iLibrary, 2020.
- 10 Blended Finance for Transition Finance: A case study of the Green Climate Fund's Private Sector Facility. Global Innovation Lab for Climate Finance, 2019.
- 11 https://www.thegpsc.org/sites/gpsc/files/26_feb_small_scale_municipal_0.pdf
- 12 <https://www.energy.gov/eere/solar/solar-integration-distributed-energy-resources-and-microgrids>
- 13 <https://www.businesstimes.com.sg/wealth/wealth-october-2023/circular-economy-pioneer-more-sum-its-parts>
- 14 <https://singaporeglobalnetwork.gov.sg/stories/business/3rd-gen-sugar-maker-helps-food-techs-make-global-impact/>
- 15 <https://www.businesstimes.com.sg/events-awards/singapore-business-awards-2021/leadership-crisis-mewah-way>
- 16 <https://www.canarymediacom/articles/clean-industry/worlds-first-major-green-steel-project-locks-down-5b-in-funding>
- 17 <https://www.eco-business.com/news/a-matter-of-survival-why-indonesian-steel-giant-gunung-raja-paksi-is-going-net-zero/>
- 18 <https://www.gunungrajapaksi.com/newsroom/gunung-raja-paksi-champions-sustainability-initiatives-in-southeast-asia-with-usd-32-million-sustainability-linked-loan-from-bni>
- 19 Please refer to the previous footnotes 13, 14, 15, 17, 18.
- 20 <https://www.mas.gov.sg/development/sustainable-finance/transition-credits>

GUAN SENG KHOO

APAC Advisory Council Member, Singapore Economic Forum, APAC Summit & EU-ASEAN Centre

Dr. Guan Seng Khoo has over 30 years of experience in the design and implementation of enterprise-wide investment, banking and risk management models, systems and processes including Environmental, Social and Governance (ESG) / Responsible Investing. His career spanned financial institutions in the USA, Canada, UK and Singapore, including the UK-listed Man Group where he was the Principal Scientist while still at Nanyang Technological University (NTU), designing and running an algorithmic, AI-based hedge fund, at American Bourses Corporation which provided robo-based analytical solutions and financial info-utilities to traders and investors in the USA and North Asia, at ATOS Origin, RHB Capital, Singapore Exchange, Standard Chartered Bank, Temasek Holdings, Alberta Investment Management Corporation (AIM-Co), CAI, the global airport investment arm of Changi Airport Group (CAG) and AEPW (Alliance to End Plastic Waste). In all these organizations, he was in charge of the enterprise and portfolio risk management functions including the sustainability finance, investment and operational due diligence process at the deal level.

He holds a PhD in Computational Physics (Material Science) from the National University of Singapore, with post-doc R&D in AI-based data mining and applications in Japan and America. He was also a co-founder of the NTU Centre for Financial Engineering and the MSc in Financial Engineering programme in collaboration with Carnegie Mellon University, Pittsburgh in 1999, when he was an academic at NTU from 1993 to 2000.

ANNIE KOH

Professor Emeritus of Finance (Practice), Singapore Management University

Annie Koh is Professor Emeritus of Finance (Practice) at Lee Kong Chian School of Business, Singapore Management University (SMU). She was also Chair of the Asian Bond Fund 2 supervisory committee for the Monetary Authority of Singapore from 2005 to 2023. Currently, she serves on Singapore's Customs Advisory Council and is a board member of Singapore Food Agency.

Professor Koh is Chairman of Prime US REIT, an independent director of AMTD IDEA Group, Mewah International Ltd., Prudential Assurance Company Singapore Pte Ltd., and Yoma Strategic Holdings Ltd. She is a board member to non-profit organisations and advises selected single-family offices and privately owned enterprises.

Prior to January 2021, Professor Koh held leadership positions at SMU including Vice President for Business Development; V3 Group Professor of Family Entrepreneurship; Academic Director of Business Families Institute and International Trading Institute; Associate Dean, Lee Kong Chian School of Business; and Dean, Office of Executive and Professional Education. She was a member of the World Economic Forum Global Future Council from 2019 to 2022, and the HR Industry Transformation Advisory Panel from 2018 to 2023.

Professor Koh earned her PhD in International Finance from Stern School of Business, New York University, in 1988 as a Fulbright scholar.



WASIN SIWASARIT

Thammasat University

Are ESG Ratings Noisy for Stock Returns? Evidence from Thailand's Stock Market

Introduction

Currently, the ESG (Environmental, Social, and Governance) trend has garnered significant attention among investors and top executives in Thailand's business sector. This is reflected in the number of funds related to governance or environmental concerns, which have increased from 2 to 120 over the past 10 years, with nearly THB80 billion in assets under management.

Additionally, the government has continuously promoted this trend. At the end of last year, the Thai ESG Fund was established to create incentives and awareness regarding ESG. As an incentive, investors can invest up to 30% of their annual taxable income, with a maximum of THB100,000, excluding the THB500,000 limit from retirement savings funds such as Super Saving Fund (SSF), Retirement Mutual Fund (RMF), and Provident Fund (PVD). Another highlight of the Thai ESG Fund is that there is no minimum purchase requirement, nor is it necessary to invest every year, provided that holdings are maintained for 8 years from the purchase date.

chase date.

As of December 28, 2023, the total value of assets invested in the Thai ESG Fund from 16 asset management companies, spanning 30 funds, amounted to approximately THB5.266 billion. Although this figure falls short of the government's target of THB10 billion, it still reflects significant investor interest, given the potentially short sales period. It is anticipated that in 2024, the Thai ESG Fund will attract even more investor interest.

Despite the growing global interest in ESG, including in Thailand, which reflects the theory that high ESG scores positively impact stock prices, the importance of ESG in investment varies, and there is no definitive empirical evidence.¹ For example, Friede et al. (2015) found a positive correlation between ESG and company performance, particularly in North America and emerging markets. Conversely, La Torre et al. (2020) concluded that the efforts of Eurostoxx50 companies in terms of ESG commitments did not appear to affect their performance in the European market. Garcia et al. (2017) discovered that profitability of firm assets was only correlated with environmental performance among ESG performance proxies, and companies with superior ESG performance were generally less profitable in BRICS (Brazil, Russia, India, China, and South Africa) markets. Additionally, sector-specific research by Cayón and Gutierrez (2021) revealed a positive correlation between sin companies² and ESG performance, while non-sin com-

panies in the top 25% and worst 25% of ESG performers exhibited a negative correlation with ESG performance in the subsequent year. Overall, the relationship between ESG ratings and stock performance remains uncertain.

The current empirical studies are inconclusive, leading to ongoing debates on the importance of ESG metrics in portfolio allocation, and there is no consensus on the application of ESG in investment management. According to Berg, Kölbel, and Rigobon (2022), one reason for the lack of standard criteria for applying ESG scores is the varying evaluation criteria among providers and the differing processes for creating models to calculate certain metrics for each aspect of ESG.

In a study by Berg et al. (2022), eight sources of ESG ratings were identified: MSCI's IVA Industry Weighted score, Sustainalytics' ESG Risk Ratings, Refinitiv's TRESG score, RepRisk's Reputation Risk Index (RRI), Truvalue Labs' (TVL) Insight Score, Moody's Global score, S&P Global's ESG score, and Institutional Shareholder Services (ISS) Numeric ESG Overall Rating. When the ESG scores from each provider were subjected to pairwise correlation, the correlations for stock markets were either negative or only slightly positive. The average correlation was just 0.2 for the U.S. stock market, with correlations ranging from -0.45 to 0.7. This result indicates issues arising from the unique evaluation methods of each provider, suggesting that a company rated highly in ESG by one pro-

vider may receive a low rating at the same time when evaluated by another provider.

Berg et al. (2022) interpret the divergence in ESG ratings as a measurement error that diminishes the true effect of ESG performance on stock returns in standard regressions. They propose two noise-correction procedures, where ESG ratings are instrumented with ratings from other ESG rating agencies, similar to the classical errors-in-variables problem. The corrected estimates reveal that the effect of ESG performance on stock returns is stronger than previously estimated.

To address this issue for Thai stocks, a method for correcting noise in ESG ratings is utilized as well. The approach introduced ratings from multiple ESG rating agencies as instrumental variables, inspired by the classical errors-in-variables problem discussed by Berg et al. (2022). The main objective of this procedure is to address the inherent noise and inconsistencies in ESG ratings. By incorporating ratings from other agencies as instruments, the proposed method aims to reduce measurement errors and enhance the accuracy of ESG assessments.

The Model and Methodology

To investigate the effect of ESG performance on stock returns, we employ the method of regression analysis proposed in Berg et al. (2022). A panel data on n firms over T periods are collected. The true regression model is

$$r_{i,t+1} = a + \beta x_{i,t}^* + \text{controls}_{i,t} + u_{i,t} \quad (1)$$

where $r_{i,t+1}$ is the stock return of firm i between time t and $t + 1$ and x^* is the true measure of the ESG of firm i at time t . There are some control variables in the regression equation. The error-component term $u_{i,t}$ of firm i at time t can contain the firm-specific effects and/or time-specific effects. To illustrate the methodology in this section, we simplify the model by omitting the control variables and assuming that $u_{i,t}$ is uncorrelated to the true ESG measure x^* and all control variables. All subscripts will be dropped to simplify the notation as well.

Attenuation Bias (Measurement Error)

Because the true ESG measure x^* is unobservable, in our regression analysis we use an ESG rating x from a rating agency, which is observable. However, the ESG rating is full of noise, i.e., it contains measurement errors:

$$x = x^* + \varepsilon \quad (2)$$

where ε is the measurement error uncorrelated with x^* and u . Thus, the regression model is

$$r = a + \beta x + v \quad (3)$$

where $v = u - \beta\varepsilon$. It is easy to see that

$$\begin{aligned} \text{cov}(x, v) &= \text{cov}(x^* + \varepsilon, u - \beta\varepsilon) = \\ &= -\beta \text{var}(\varepsilon) \neq 0 \end{aligned} \quad (4)$$

Therefore, this regression model has an endogeneity problem. Thus, the OLS (Ordinary Least Squares) estimator will estimate

$$\beta_{\{OLS\}} = \left(\frac{\text{var}(x^*)}{(\text{var}(x^*) + \text{var}(\varepsilon))} \right) \beta \quad (5)$$

Since the term in the parenthesis is positive and less than 1, the OLS estimate will be downwardly biased towards zero. This is called an *attenuation bias*.

The endogeneity problem from a measurement error can be fixed easily by using an instrumental variable (IV). An IV z satisfies three properties which are (i) exogeneity: $\text{cov}(z, u) = 0$, (ii) relevance: $\text{cov}(z, x) \neq 0$, and (iii) positive and finite variance: $0 < \text{var}(z) < \infty$. An obvious choice of IV for the ESG rating variable is another ESG rating z_1 from another rater. Therefore,

$$z_1 = x^* + \eta_1, \quad (6)$$

where η_1 is the measurement error uncorrelated with x^* and u . If the raters construct their ESG ratings independently, we may assume that η_1 is uncorrelated with ε as

well. Hence the IV estimator will estimate

$$\beta_{\{IV\}} = \beta + \frac{\text{cov}(z_1, v)}{\text{cov}(z_1, x)} = \beta + \frac{0}{\text{var}(x^*)} = \beta \quad (7)$$

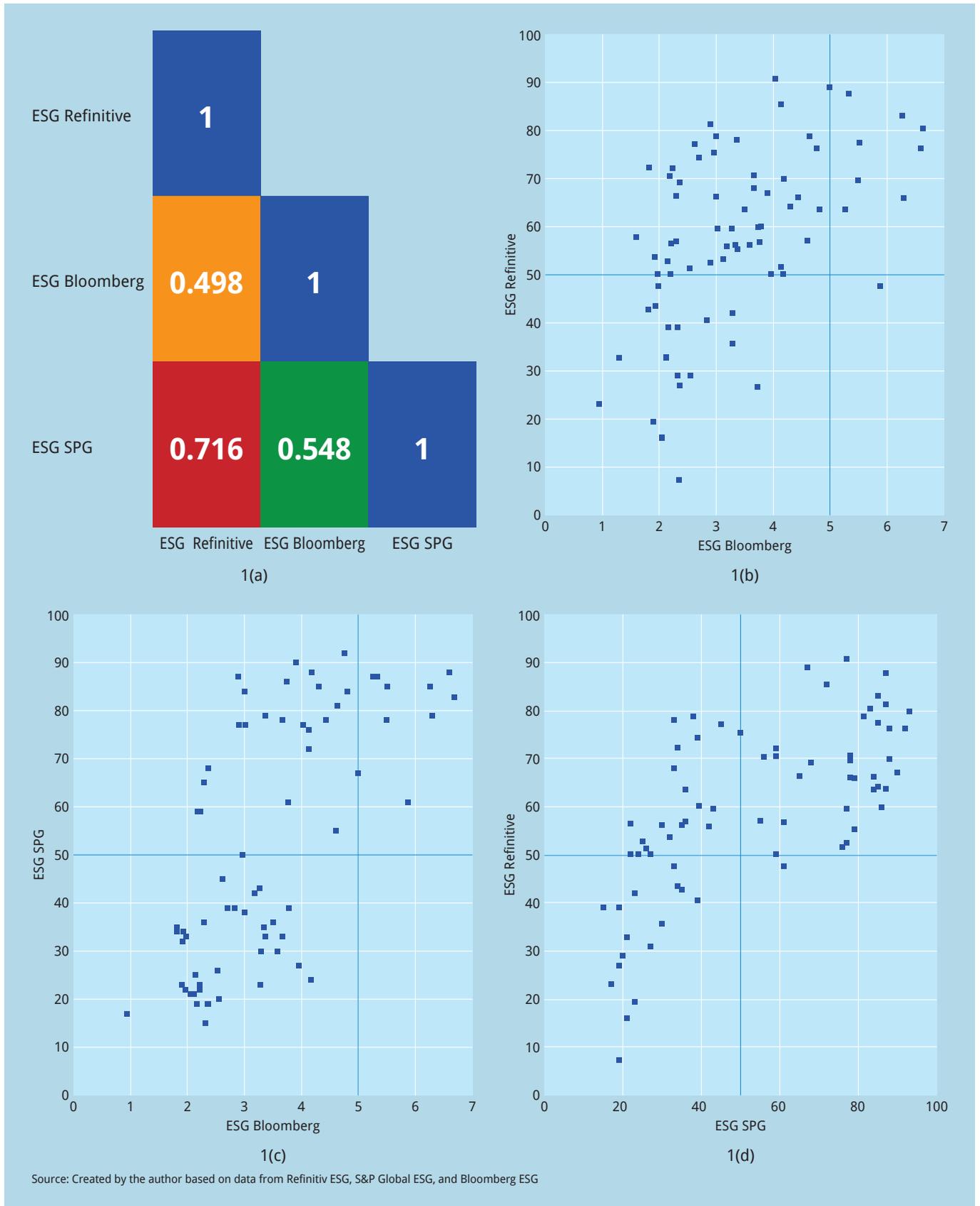
that is, the IV estimator will estimate the true β . Therefore, the ratio of the OLS estimator and the IV estimator can estimate the attenuation bias.

ESG Ratings in Thailand

ESG rating agencies are known to provide diverging ESG scores because they use different data sources and models for their assessments. These data sources vary widely; for example, if a company's carbon emissions data is missing, a standard carbon emissions model is used to estimate the expected emissions for that firm. Additionally, different ESG rating agencies assign different weights to various ESG components. As a result, the ESG ratings can be inconsistent and noisy, as illustrated by Figure 1. Figure 1(a) displays the correlation matrix for three different agencies, highlighting that Bloomberg scores diverge from the others. The pairwise correlation between ESG Refinitiv and ESG Bloomberg is just 0.498, and it rises slightly to 0.548 when compared with ESG S&P Global. Given this discrepancy, it is likely that some firms may receive high scores from one agency but low scores from another. This crucial point is illustrated by Figures 1(b), 1(c), and 1(d), which show scatter plots comparing the ESG scores of two rating agencies in 2022. In these plots, several firms are located in the upper left corner, indicating significant discrepancies between the scores assigned by the two agencies.



Figure 1: Correlation Matrix of ESG Scores Provided by Three ESG Rating Agencies and Scatter Plots between Two Agencies' Ratings in 2022



Empirical Results

In this section, we address the problem of noise in ESG ratings that may arise from using different scores from different agencies. To determine the validity of the scores from different agencies, we use data from three ESG rating providers: Refinitiv, S&P Global, and Bloomberg. Figure 2 presents the average ESG scores for each agency from 2015 to 2022. It is evident that the average scores across the three agencies remained quite steady but contain noise. Table 1 presents the descriptive statistics for the ESG variables as well as the financial variables. For Refinitiv and S&P Global, the ratings are on a scale from 0 to 100, whereas the scores for Bloomberg ESG scores range from 0 to 10. A high value of a rating signifies good performance and a low rating signifies poor performance. The sample consists of 70 firms in Thailand's stock market.

To quantify the problem of noise, we estimate the OLS regressions of stock returns on ESG ratings and compare them to the standard asset pricing model, which can be written as follows:

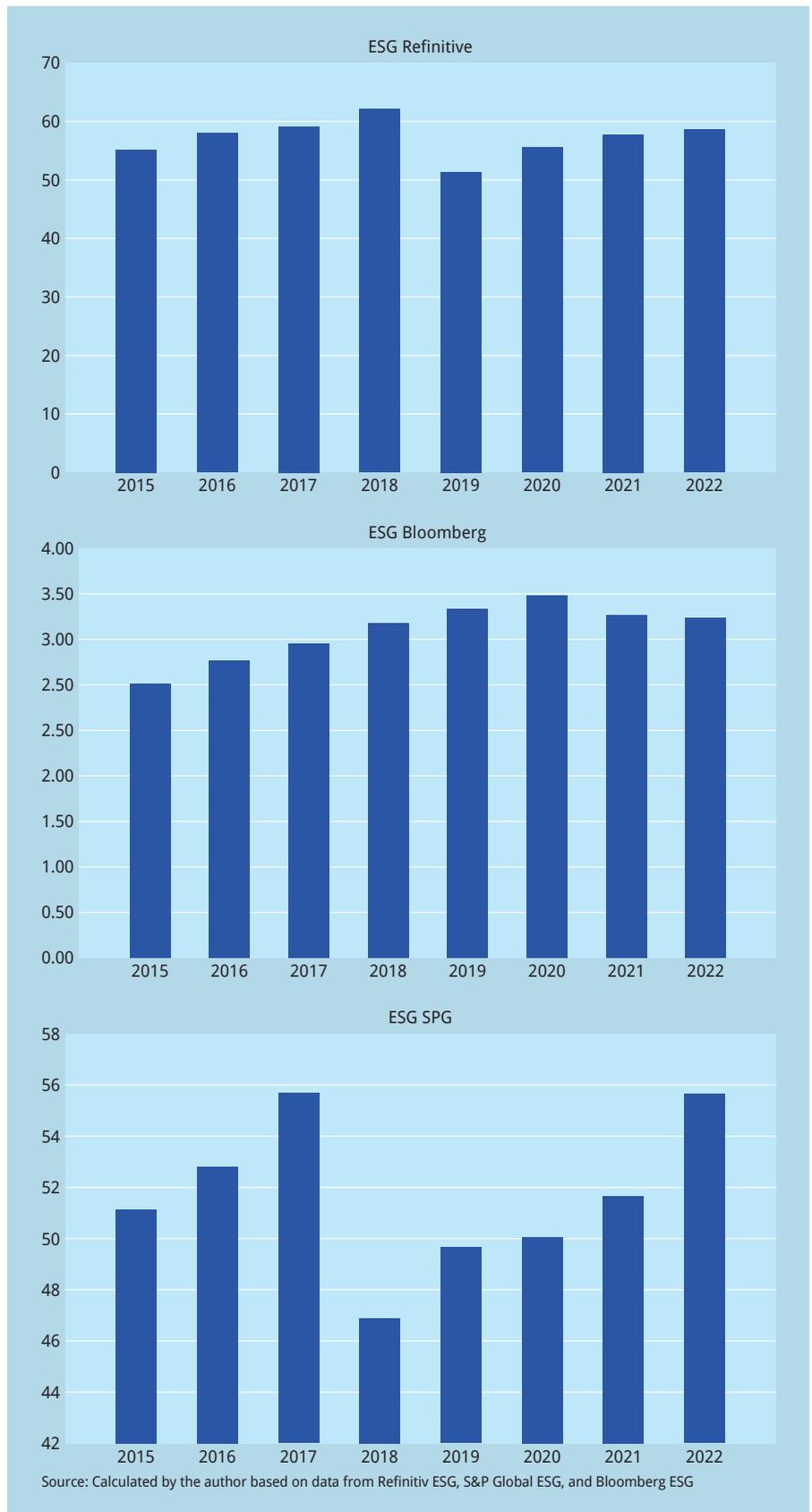
$$r_{k,t+1} = a + \beta Y_{i,t}^* + \text{controls}_{i,t} + u_{\{i,t\}} \quad (8)$$

$$i = 1, \dots, n; t = 1, \dots, T$$

Where $Y_{i,t}^*$ denotes the ESG rating of firm k , by rater i , in year t . All returns are monthly. Using the same model specification in the work of Lewellen (2015), we include stock-level controls consisting of Dividends, Market Value, Market-to-Book, Asset Growth, ROA (Return on Assets), Momentum, and Volatility. All models are estimated with industry and month fixed effects.

We estimate the OLS regressions of stock returns on ESG ratings and contrast them with Two-Stage Least Squares regressions (2SLS), which use scores from other rating agencies as instruments. Table 2 reports the main empirical results based on three different scores and two different models. All of the OLS coefficients on ESG ratings are negative, indicating that higher ESG scores lead to lower returns for Thai stocks on average. However, two of the three OLS coefficients, those for Refinitiv and S&P Global scores, are not significant.

Figure 2: Average ESG Scores on Thai Stocks for 2015-22 from Three ESG Rating Providers



When we use the 2SLS method, utilizing scores from other rating agencies as instruments, we find, as expected, that the OLS estimators suffer from attenuation bias (measurement error). After controlling with the IV, the 2SLS coefficients for Refinitiv and S&P Global scores become significant at the 1 percent level, and their magnitudes increase as expected.

Key Takeaway

It is evident that there are noise issues in ESG data. This creates the problem of at-

tenuation bias which affects statistical inferences obtained from standard regression models. In particular, the problem exists in the case of ESG data for Thai stocks which this article examines. The problem of downward bias is resolved here by applying the concepts of Berg et al. (2022) and using 2SLS, with scores from other rating agencies as instruments. This method resulted in ESG coefficients that are more than twice the size of those obtained from OLS models and that became statistically significant.

Table 1: Descriptive Statistics for All Variables

	Mean	StDev	Min	Max
ESG Scores				
Refinitiv	56.73	18.66	2.42	91.82
S&P Global	51.93	25.08	7.00	93.00
Bloomberg	3.21	1.38	0.56	6.62
Financial Variables				
Return	0.49	2.94	-10.99	16.78
Dividend Yield	2.96	2.35	0.00	19.72
Market-to-Book	3.32	2.82	0.27	21.88
Asset Growth	16.38	60.47	-84.90	1325.66
ROA	7.55	7.07	-16.09	64.09
Momentum	0.47	2.87	-7.29	23.19
Volatility	0.09	0.05	0.02	0.30

Note: Return is the average of monthly returns in percent from month +1 to +12; Dividend Yield is per share over the prior 12 months divided by price at the end of the prior month; Market-to-Book is the logarithm of market value of equity minus the logarithm of book value of equity at the end of the prior month; Asset Growth is the logarithm of growth in total assets in the prior fiscal year; ROA is income before extraordinary items divided by average total assets in the prior fiscal year; Momentum is return from month -12 to month -2; and Volatility is the monthly standard deviation, estimated from returns from months -12 to -1.

Source: Calculation by the author

Table 2: Estimation Results for Stock Returns and ESG Ratings

	OLS		IV		OLS		IV		OLS		IV	
	Coeffs	StdErr										
Refinitiv	-0.019	0.014	-0.058***	0.026								
S&P Global					-0.011	0.010	-0.077***	0.026				
Bloomberg									-0.721***	0.182	-0.557	0.35
Return(-1)	-0.405***	0.055	-0.40***	0.062	-0.362***	0.048	-0.342***	0.069	-0.365***	0.054	-0.373***	0.064
ROA	0.158***	0.035	0.179***	0.045	0.155***	0.033	0.153***	0.045	0.177***	0.038	0.174***	0.043
Momentum	0.503***	0.052	0.492***	0.062	0.496***	0.054	0.416***	0.072	0.510***	0.054	0.515***	0.063
Asset Growth	0.004	0.005	0.006	0.006	0.005	0.005	0.006	0.006	0.008	0.005	0.004	0.006
Market-to-Book	-0.265**	0.117	-0.387***	0.137	-0.420***	0.114	-0.438***	0.141	-0.424**	0.123	-0.512***	0.145
Dividend Yield	-0.086	0.088	-0.129	0.097	-0.062	0.08	-0.159	0.105	-0.124	0.078	-0.045	0.096
Volatility	1.83	2.636	5.725*	3.179	0.846	2.807	1.282	3.391	5.150*	2.89	4.596	3.084
Constant	1.398	1.051	3.793**	1.817	1.3	0.821	5.507***	1.884	2.864***	0.85	2.535	1.573
R ²	0.47		0.43		0.39		0.28		0.45		0.432	

Note: ***, ** and * indicate statistical significance at 1%, 5%, and 10% levels, respectively.

Source: Calculation by the author



This analysis suggests that investors or practitioners should reference several different ESG ratings in evaluating the investment prospects for a company. Given how ESG ratings tend to diverge across rating agencies, it is highly recommended to use as an instrument a second ESG rating from a different agency, if available, to obtain stronger empirical results and more reliable information on the effect of ESG performance on stock returns. The 2SLS method is superior to the traditional OLS approach.

Notes

- 1 See more detailed information in the meta-study by Atz, Bruno, Liu, and Van Holt (2022), which compiled 1,141 empirical studies from 2015 to 2020 to examine the relationship between ESG scores and company financial performance.
- 2 Sin companies are publicly traded companies associated with activities that are considered unethical or immoral.

References

Atz, U., Van Holt, T., Liu, Z. Z., & Bruno, C. C. (2022). Does sustainability generate better financial performance? Review, meta-analysis, and propositions. *Journal of Sustainable Finance & Investment*, 13(1), 802-825.

Berg, F., Kölbl, J. F., & Rigobon, R. (2022). Aggregate confusion: The divergence of ESG ratings. *Review of Finance*, 26(6), 1315-1344.

Berg, F.; Koelbel, J. F.; Pavlova, A.; Rigobon, R. (2022). "ESG Confusion and Stock Returns: Tackling the Problem of Noise". *NBER Working Paper No. 30562*: 1-67.

Cayón, E., Gutierrez, J. C. (2021). "Sin stocks and ESG scores: Does the nature of your business really matter?" *Journal of International Studies*, 14(3), 114-123.

Davidson, Russell; McKinnon, James G. (1993). "Estimation and Inference in Econometrics". New York: Oxford University Press.

Falck, O., Heblich, S. (2007). "Corporate social responsibility: Doing well by doing good". *Business horizons*, 50(3), 247-254.

Friede, G., Busch, T., Bassen, A. (2015). "ESG and financial performance: aggregated evidence from more than 2000 empirical studies". *Journal of Sustainable Finance Investment*, 5(4), 210-233.

García, A. S., Mendes-Da-Silva, W., Orsato, R. J. (2017). Sensitive industries produce better ESG performance: Evidence from emerging markets. *Journal of Cleaner Production*, 150, 135-147.

Hansen, Lars Peter (1982). "Large Sample Proper-

ties of Generalized Method of Moments Estimators". *Econometrica*. 50 (4): 1029-1054.

La Torre, M., Mango, F., Cafaro, A., Leo, S. (2020). "Does the esg index affect stock return? evidence from the eurostoxx50". *Sustainability*, 12(16), 6387.

Sargan, J. D. (1958). "The Estimation of Economic Relationships Using Instrumental Variables". *Econometrica*. 26 (3): 393-415.

WASIN SIWASARIT

Lecturer, Faculty of Economics, Thammasat University

Wasin Siwasarit is currently a lecturer at the Faculty of Economics, Thammasat University. His research is in the areas of Asset Pricing (Skewness in Asset Pricing), and Financial Econometrics (MIDAS: Mixed Data Sampling). He received his PhD. in Economics from University of North Carolina at Chapel Hill, U.S.A. in 2015.

Previously, he obtained his B.A (First Class, Honors) and M.A (English Program) in Economics from Thammasat University. His published work includes 'Skewness in Expected Macro Fundamentals and the Predictability of Equity Returns' in the *Review of Financial Studies* (2016).

Introducing Nomura Foundation

Nomura Foundation (the Foundation) is a public interest incorporated foundation formed in 2010 from the combined resources of three existing foundations established by Nomura Group, a financial services group comprising Nomura Holdings and its subsidiaries in Japan and overseas. The Foundation aims to support a dynamic and sustainable economy and society by promoting the social science disciplines, enhancing international understanding, and fostering young academic and artistic talent. It focuses on four program areas: Social Sciences, Foreign Student Scholarships, Arts and Culture, and the World Economy.

The World Economy program supports research, conferences, and publications related to the macro economy and capital markets.

In the macro economy area, the Foundation has organized conferences together with experts from the Brookings Institution (US), Chatham House (UK), the Development Research Center of the State Council (China), and Bruegel (Belgium) as well as Nomura Securities and Nomura Institute of Capital Markets Research to share research on such topics as monetary and financial institutions, fiscal stability, and demographic change and sustainability.



Panel Discussion at the 2015 Forum

In the area of capital markets, the Foundation has organized conferences and roundtable discussions in conjunction with the Brookings Institution, the Wharton School, the Development Research Center of the State Council (China), China's Center for International Knowledge on Development and Nomura Institute of Capital Markets Research. It has also provided financial backing for several conference volumes published by the Brookings Institution, *Capital Markets in India* published by Sage, Inc., and the quarterly Japanese-language journal *Chinese Capital Markets Research*.

Research papers and presenta-

tions prepared for conferences and the content of print publications are available on the Foundation's website <http://nomurafoundation.or.jp/en>.

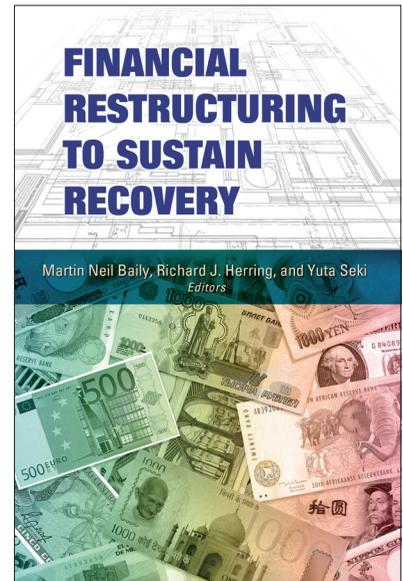
With the expanding importance of Asia in the 21st century global economy, the Foundation has been increasing its support of intellectual interactions among experts at think tanks, universities and government agencies in the region. As part of this effort and recognizing the importance of capital market development in promoting economic growth and prosperity in Asian countries, the Foundation started publishing *Nomura Journal of Asian Capital Markets* in 2016.



Cover of *Chinese Capital Markets Research*



Lord Mervyn King at the 2015 Forum



Cover of *Financial Restructuring to Sustain Recovery*

Introducing Nomura Institute of Capital Markets Research

Nomura Institute of Capital Markets Research (NICMR) was established in April 2004 as a subsidiary of Nomura Holdings to build on a tradition begun in 1965 of studying financial and capital markets as well as financial systems, structure, and trends. NICMR develops original research and policy proposals by specialists based upon knowledge of actual business practice.

NICMR publishes some of its research output in Japanese in *Nomura Capital Markets Quarterly* as well as *Nomura Sustainability Quarterly*, and posts some items in Japanese, English, and Chinese on its website.

NICMR's core mission is to contribute to reform of Japan's financial system and securities market in order to foster establishment of a market-structured financial system. Structural changes, particularly population aging, are having a major impact on Japan's economy and society. Addressing the challenges created by these changes calls for reforming social security, tax, and public finance systems. One of Japan's most valuable resources is the approximately JPY2,200 trillion in financial assets held by households. Establishing a market mechanism-driven money-flow that makes efficient, effective use of these assets is critical to the country's future.

NICMR's research focus extends well beyond Japan to encompass current issues in capital markets around the world. In addition to research offices in New York, London and Beijing, NICMR established a research office in Singapore in 2015 to strengthen its Asian research platform.

The continued growth of Asian economies including China is generating huge funding needs for infrastructure and creating an urgent need for indirect

financing systems and robust capital markets in the region. Promoting the development of Asian capital markets is a key for the future of Asian financial systems and economies. Moreover, it is important that Asian perspectives and regional differences are recognized in the post-global financial crisis environment of closer cooperation among financial regulators making rules and global standards.

NICMR's recommendations for developing financial and capital markets in Asia are based on analyses of past experience in developed economies. In particular, Japan offers useful lessons on the importance of direct finance for supporting new businesses and of investment services to cater to the needs of a growing middle class.

NICMR has also been working to strengthen its sustainability initiatives. To this end, it established the Nomura Research Center of Sustainability in December 2019. This research center focuses on objective and practical research into areas of sustainability closely related to the financial and capital markets in major regions including Asia.

As a member of the Nomura Group, a global financial group based in Asia, NICMR strives to contribute to the development of financial and capital markets in Japan and the rest of Asia through fundamental research and experience-based policy recommendations.



Cover of *Nomura Capital Markets Quarterly*



Cover of *Nomura Sustainability Quarterly*

BACK ISSUES

AUTUMN 2016	Vol.1/No.1	(Inaugural Issue)
SPRING 2017	Vol.1/No.2	Infrastructure Financing
AUTUMN 2017	Vol.2/No.1	FinTech in Asia
SPRING 2018	Vol.2/No.2	Future of Exchanges
AUTUMN 2018	Vol.3/No.1	India's Capital Markets
SPRING 2019	Vol.3/No.2	Pension System
AUTUMN 2019	Vol.4/No.1	Emerging Trends in ESG Investing and Sustainable Finance
SPRING 2020	Vol.4/No.2	Importance of Mutual Fund Industry for Capital Market Development
AUTUMN 2020	Vol.5/No.1	Transformation of Fundraising for SMEs and Startups
SPRING 2021	Vol.5/No.2	Capital Market Development During the COVID-19 Pandemic
AUTUMN 2021	Vol.6/No.1	Changing Financial Behavior of Firms and Households amid COVID-19
SPRING 2022	Vol.6/No.2	Development of Sustainable Finance Markets toward Achieving the SDGs
AUTUMN 2022	Vol.7/No.1	Innovation and Leveraging Technologies in Asian Financial Sectors and Capital Markets
SPRING 2023	Vol.7/No.2	
AUTUMN 2023	Vol.8	

NOMURA JOURNAL OF ASIAN CAPITAL MARKETS

AUTUMN 2024 Vol.9

Publication Date: August 30, 2024
Editor: Nomura Institute of Capital Markets Research
Publisher: Nomura Foundation
Toyosu Bayside Cross Tower,
2-2-1 Toyosu, Koto-ku, Tokyo, 135-0061, Japan
<http://www.nomurafoundation.or.jp/en/>

Copyright © 2024. NOMURA FOUNDATION. All rights reserved.

The information and opinions in this publication are for general information only and are not intended as an offer or solicitation with respect to purchase or sale of any financial instruments or as personal investment advice. Although this publication is compiled based upon information that Nomura Foundation considers reliable, Nomura Foundation does not guarantee its accuracy or completeness, nor does Nomura Foundation assume any liability for any loss that may result from the reliance by any person upon any information or opinions contained herein. Such information and opinions are subject to change without notice.

NOMURA