Development of Infrastructure Bond Market and Green bond

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Chair person of JGB investors’ meeting at MOF, JAPAN
Outline of the Presentation

1. COVID-19 and huge budget deficits
2. Infrastructure Investments are needed
3. Infrastructure floating bond
4. Need for digital infrastructure
5. Green bond
6. Monetary Policy and Green Bond Market
7. Policy recommendations
Figure 5.4: Debt Service in Selected Developing Asian Economies, 2019 and 2020

a. Debt Service on External Debt to Total External Debt, 2019 (%)

b. Debt Service on External Debt to Total Revenues, 2020 (%)

Non-ASEAN+3  ASEAN+3  EMDE median
### Table 5.2: Public and Private Infrastructure Investment in Asia, 2010–2014 (% of GDP)

<table>
<thead>
<tr>
<th>Region</th>
<th>Private</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 ADB Developing Member Countries</td>
<td>0.4</td>
<td>5.1</td>
</tr>
<tr>
<td>East Asia</td>
<td>app. 0</td>
<td>6.3</td>
</tr>
<tr>
<td>South Asia</td>
<td>1.8</td>
<td>3.0</td>
</tr>
<tr>
<td>Central and West Asia</td>
<td>0.3</td>
<td>2.6</td>
</tr>
<tr>
<td>Pacific</td>
<td>0.3</td>
<td>2.5</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>0.5</td>
<td>2.1</td>
</tr>
<tr>
<td>People’s Republic of China</td>
<td>app. 0</td>
<td>6.3</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.3</td>
<td>2.3</td>
</tr>
</tbody>
</table>

ADB = Asian Development Bank, GDP = gross domestic product.

Note: The numbers are based on 25 selected countries listed in Appendix 3.1 of ADB (2017). Source: ADB (2017).
Realizing The Potential of Public Private Partnerships to Advance Asia’s Infrastructure Development

PPP = Public Private Partnerships

ADB (2019)
Figure 5.2: Expected Rate of Return and Risk Profile of Project Bonds versus Benchmark Yield
Figure 5.6: Conflict of Interest between Users and Investors

- Users → Infrastructure → Private Investors
  - low fee → Conflicts
  - high rate of return

Source: Authors.
5 Financing Sustainable Infrastructure Investment in ASEAN+3

Naoyuki Yoshino, Saloni Lakhia, and Josef Yap
Spillover Effects of Infrastructure

Railway, Road, Water supply, Digital Infrastructure

Highway
(User charges)
(low rate of return)

Spillover effect
Non-affected region

Employment

Spillover effect
Non-affected region

Private investment
SME development

Spillover effect
Increase of property tax revenue
Diagram of Spillover Tax Revenues

\[ \Delta \text{Tax} = t^* \Delta Y \]
(no need for increase in tax rates)

Subsidy = 0.5\*\Delta \text{Tax}

Financing infrastructure using floating-interest-rate infrastructure bond

Naoyuki Yoshino*, Dina Azghaliyeva² and Ranjeeta Mishra²

Figure 4. The proposed floating-rate infrastructure bonds to make spillover tax return in practice.
Infrastructure & Education
Yoshino and Umid Abidhadjaev (2016)

Education

In a study of 44 countries, Professor Yoshino found that education played a significant role in impacting the quantum of the spillover effect. Secondary schools provided basic skills for blue collar workers. Universities provided education for highly skilled workers. Workers’ education level impacted businesses’ productivity.
Firms in emerging markets accelerated e-commerce adoption following the first COVID-19 cases in their countries.

Uneven Recovery: East Asia and Pacific Economic Update
World Bank, April 2021
SDG Investments: 17 Goals (UN)
Sustainable Development Goals
Millennium Development Goals
ESG: Environment, Social and Governance
The evaluation methodologies and criteria for ESG scores vary from one evaluating organization to another.

1. some agency uses its own criteria to evaluate a company's ESG efforts,
2. some agency assign a score based on the degree of disclosure,
3. some agency uses a score based on whether or not the company has an ESG policy,
4. some agency uses a score based on actual ESG activities such as carbon dioxide reduction by judging from performance, and so on.

It raises issues whether ESG scores actually reflect ESG activities and outcomes by companies (Chatterji et al. 2009, Drempetic et al. 2019).
<table>
<thead>
<tr>
<th>ESG Scores</th>
<th>Overview of Rating Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bloomberg ESG Disclosure Scores</td>
<td>Evaluating by degree of ESG disclosure</td>
</tr>
<tr>
<td>FTSE Russell’s ESG Ratings</td>
<td>Evaluating by ESG risks based on disclosure and commitment to policy development and improvement</td>
</tr>
<tr>
<td>ISS Quality Score</td>
<td>Evaluating governance (board composition, shareholder and takeover defenses, compensation and remuneration, and audit and risk monitoring)</td>
</tr>
<tr>
<td>MSCI ESG Ratings</td>
<td>Evaluating by 37 key ESG issues</td>
</tr>
<tr>
<td>RobecoSAM Corporate Sustainability Assessment</td>
<td>Evaluating by economy, environment and society. Governance is included in the economy.</td>
</tr>
<tr>
<td>Sustainalytics’ ESG Risk Ratings</td>
<td>Evaluating by ESG measures, disclosures, and the level of the problem</td>
</tr>
<tr>
<td>Thomson Reuters ESG Scores</td>
<td>Evaluating by 10 categories (environment [resource use, emissions, and innovation], society [employees, human rights, local communities, and product responsibility], and governance [management, shareholders, and CSR strategy]).</td>
</tr>
</tbody>
</table>

Source: Bloomberg, ESG rating organization websites, and Yuyama et al. (2020).
U = R - βσ^2 + γ(ESG)

α_t = \frac{1}{2β} \left( R^A_t - R^B_t \right) + \frac{γ}{2β} \left( SDG^A_t - SDG^B_t \right) \left( \sigma_t^A \right)^2 - \left( \sigma_t^B \right)^2

ESG Score

R(Return)

σ(Risk)
ESG scores of these two companies are different by the ESG rating agencies as is summarized in Table 4.

<table>
<thead>
<tr>
<th>EGS Score</th>
<th>Optimal portfolio without ESG considerations</th>
<th>Rating agency (1)</th>
<th>Rating agency (2)</th>
<th>Rating agency (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESG score of company A</td>
<td>-</td>
<td>8.6</td>
<td>9.6</td>
<td>2.9</td>
</tr>
<tr>
<td>ESG score of company B</td>
<td>-</td>
<td>1.8</td>
<td>1.3</td>
<td>3.9</td>
</tr>
<tr>
<td>Value of $\alpha$</td>
<td>0.57</td>
<td>0.71</td>
<td>0.74</td>
<td>0.54</td>
</tr>
</tbody>
</table>

Note: Each ESG score is converted to a 10-point scale for comparison. Source: Based on each company’s 2019 actual stock returns, standard deviation, covariance, and ESG score. Author’s calculations based on equation (12) from Bloomberg data.

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ESG/Green Investment and Allocation of Portfolio Assets

NAOYUKI YOSHINO\(^1\), TOMONORI YUYAMA\(^2\)
Optimal portfolio allocation can be achieved by taxing GHG (Green House Gas)

1, By taxing wastes such as CO2, NOX, Plastics etc. by identical international taxation, the investors can only look for rate of return and risks as they were conventionally focused on.

2, International taxation will lead to optimal asset allocation and achieve sustainable growth
Environmental Issues can be solved by Carbon tax and other tax policies

Rate of return will be lowered if CO2 emission is large

\[
\hat{R}_t^A = R_t - T_A
\]

\[
\hat{R}_t^B = R_t - T_B
\]

Equations (16) and (17) show the after-tax rate of return of company A and company B. We can compute the optimal allocation of assets between company A and company B as in equations (18) and (19), which show the optimal rate of return and risks, respectively:

\[
\hat{R}_t = \bar{\alpha}_t \hat{R}_t^A + (1 - \bar{\alpha}_t)\hat{R}_t^B
\]

\[
\bar{\sigma}_t^2 = \bar{\alpha}_t^2 (\bar{\sigma}_t^A)^2 + (1 - \bar{\alpha}_t)^2 (\bar{\sigma}_t^B)^2 + 2\bar{\alpha}_t(1 - \bar{\alpha}_t)\bar{\sigma}_t^{AB}
\]
**Satellite Photo** can monitor CO2 exposures, solar power panels, size of Green area etc.
June 2018
Green Bond Principles
Voluntary Process Guidelines for Issuing Green Bonds

International Capital Market Association
ICMA Paris Representative Office
62 rue la Boétie
75008 Paris
France
Tel: +33 1 70 17 64 70
greenbonds@icmagroup.org

- renewable energy (including production, transmission, appliances and products);
- energy efficiency (such as in new and refurbished buildings, energy storage, district heating, smart grids, appliances and products);
- pollution prevention and control (including reduction of air emissions, greenhouse gas control, soil remediation, waste prevention, waste reduction, waste recycling and energy/emission-efficient waste to energy);
- environmentally sustainable management of living natural resources and land use
<table>
<thead>
<tr>
<th>(i) renewable energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ii) energy efficiency</td>
</tr>
<tr>
<td>(iii) pollution prevention and control</td>
</tr>
<tr>
<td>(iv) environmentally sustainable management of living natural resources and land use</td>
</tr>
<tr>
<td>(v) terrestrial and aquatic biodiversity conservation</td>
</tr>
<tr>
<td>(vi) clean transportation</td>
</tr>
<tr>
<td>(vii) sustainable water and wastewater management</td>
</tr>
<tr>
<td>(viii) climate change adaptation</td>
</tr>
<tr>
<td>(ix) eco-efficient and/or circular economy adapted products, production technologies and processes</td>
</tr>
<tr>
<td>(x) green buildings which meet regional, national or internationally recognized standards or certifications.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Region</th>
<th>Entity</th>
<th>Issues (EUR Billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sweden</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Bank</td>
<td>SBAB Bank</td>
<td>397</td>
</tr>
<tr>
<td></td>
<td>Swedish Export Credit</td>
<td>444</td>
</tr>
<tr>
<td>LGFA</td>
<td>Kommuninvest</td>
<td>1,511</td>
</tr>
<tr>
<td>Bank</td>
<td>Nordea Bank</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>SEB</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Swedbank</td>
<td>500</td>
</tr>
<tr>
<td>Local government</td>
<td>City of Gothenburg</td>
<td>601</td>
</tr>
<tr>
<td></td>
<td>City of Lunds</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>City of Malmö</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td>City of Norrköping</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>City of Västerås</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>Örebro Kommun</td>
<td>133</td>
</tr>
<tr>
<td></td>
<td>Region Skåne</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>Stockholms Läns Landsting</td>
<td>518</td>
</tr>
<tr>
<td><strong>Agri/Forestry</strong></td>
<td>Södra Skogsägarna</td>
<td>107</td>
</tr>
<tr>
<td></td>
<td>Svenska Cellulosa AB</td>
<td>170</td>
</tr>
<tr>
<td></td>
<td>Sveaskog</td>
<td>213</td>
</tr>
</tbody>
</table>

**SEK issuance dominates for outstanding green bonds**

- **EUR Billions**
- **0**
- **2.0**
- **4.0**
- **6.0**
- **8.0**

**Years**
- **1-3Y**
- **3-5Y**
- **5-7Y**
- **7-10Y**
- **10-15Y**
- **Over 50Y**

**Countries**
- Finland
- Denmark
- Norway
- Sweden
Green Central Bank

- Gold
- SDR
- Green Bond
- Ordinary Bond

Money Supply
# Green Credit Rating (Example)

<table>
<thead>
<tr>
<th>Credit Rating</th>
<th>Greenness(%)</th>
<th>CO₂</th>
<th>NOₓ</th>
<th>Plastic</th>
<th>N₂O</th>
<th>etc</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>100 ～ 90</td>
<td>AAA</td>
<td>AAA</td>
<td>AAA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AA</td>
<td>90 ～ 80</td>
<td>A</td>
<td>AA</td>
<td>AAA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>80 ～ 70</td>
<td>A</td>
<td>AA</td>
<td>BBB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BBB</td>
<td>70 ～ 60</td>
<td>BBB</td>
<td>BB</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BB</td>
<td>60 ～ 50</td>
<td>BB</td>
<td>BB</td>
<td>BB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>50 ～ 40</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCC</td>
<td>40 ～ 30</td>
<td>CCC</td>
<td>B</td>
<td>CCC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC</td>
<td>30 ～ 20</td>
<td>CC</td>
<td>C</td>
<td>CCC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>20 ～ 10</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Debt/GDP ratio (IMF)
10-Year Government Bonds Yields

(Source) Bloomberg
<table>
<thead>
<tr>
<th>Holders of Japanese Government bonds</th>
<th>% of total</th>
<th>Holders of Greek Government bonds</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank and postal savings</td>
<td>45</td>
<td>Overseas investors</td>
<td>33</td>
</tr>
<tr>
<td>Life and non-life insurance</td>
<td>20</td>
<td>Domestic investors</td>
<td>21</td>
</tr>
<tr>
<td>Public pension funds</td>
<td>10</td>
<td>European Central Bank</td>
<td>18</td>
</tr>
<tr>
<td>Private pension funds</td>
<td>4</td>
<td>Bilateral loans</td>
<td>14</td>
</tr>
<tr>
<td>Bank of Japan</td>
<td>8</td>
<td>Social pension funds</td>
<td>6</td>
</tr>
<tr>
<td>Overseas investors</td>
<td>5</td>
<td>International Monetary Fund</td>
<td>5</td>
</tr>
<tr>
<td>Households</td>
<td>5</td>
<td>Greek domestic funds</td>
<td>3</td>
</tr>
<tr>
<td>Others</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Optimal fiscal policy rule for achieving fiscal sustainability: *the Japanese case*  
Yoshino-Mizoguchi-Hesary [2019]
Figure 1  Government bond markets of Japan and Greece (see online version for colours)

Supply and Demand for Japanese Government Bonds (JGB)

Supply and Demand for Greek Government Bonds

Optimal fiscal policy rule for achieving fiscal sustainability: the Japanese case

Yoshino-Mizoguchi-Hesary (2019)
Breakdown by JGB Holders (Sep. 2013, QE)

- **Foreigners**: 78.6 trillion yen (8.0%)
- **Pension Funds**: 31.3 trillion yen (3.2%)
- **Public Pensions**: 69.1 trillion yen (7.1%)
- **Households**: 22.0 trillion yen (2.2%)
- **Others**: 14.4 trillion yen (1.5%)
- **General Government (ex Public Pensions)**: 16.3 trillion yen (1.7%)
- **Fiscal Loan Fund**: 2.2 trillion yen (0.2%)
- **BOJ**: 170.1 trillion yen (17.4%)
- **Banks, etc.**: 383.5 trillion yen (39.1%)

Note 1: "JGB" includes FILP Bonds and T-Bills.
Note 2: "Banks, etc" includes Japan Post Bank, "Securities investment trust" and "Securities Companies."
Note 3: "Life and Nonlife insurance" includes Japan Post Insurance.
Source: Bank of Japan
Fig.1-10 Market Issuance Plan by JGB Types for FY2019 (①～④)

(Unit: trillion yen)

<table>
<thead>
<tr>
<th></th>
<th>FY2018 (Initial)</th>
<th></th>
<th>FY2019 (Initial)</th>
<th></th>
<th>(b) − (a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(per time)</td>
<td>(total ; a)</td>
<td>(per time)</td>
<td>(total ; b)</td>
<td></td>
</tr>
<tr>
<td>40-Year (①)</td>
<td>0.4 × 6times</td>
<td>2.4</td>
<td>0.4 × 6times</td>
<td>2.4</td>
<td>—</td>
</tr>
<tr>
<td>30-Year</td>
<td>0.7 × 12times</td>
<td>8.4</td>
<td>0.7 × 12times</td>
<td>8.4</td>
<td>—</td>
</tr>
<tr>
<td>20-Year</td>
<td>1.0 × 12times</td>
<td>12.0</td>
<td>0.9 × 12times</td>
<td>10.8</td>
<td>▲1.2</td>
</tr>
<tr>
<td>10-Year</td>
<td>2.2 × 12times</td>
<td>26.4</td>
<td>2.1 × 12times</td>
<td>25.2</td>
<td>▲1.2</td>
</tr>
<tr>
<td>5-Year</td>
<td>2.0 × 12times</td>
<td>24.0</td>
<td>1.9 × 12times</td>
<td>22.8</td>
<td>▲1.2</td>
</tr>
<tr>
<td>2-Year</td>
<td>2.1 × 12times</td>
<td>25.2</td>
<td>2.0 × 12times</td>
<td>24.0</td>
<td>▲1.2</td>
</tr>
<tr>
<td>TBs(1-Year) (②)</td>
<td>1.8 × 12times</td>
<td>21.6</td>
<td>1.8 × 12times</td>
<td>21.6</td>
<td>—</td>
</tr>
<tr>
<td>10-Year Inflation Indexed (③)</td>
<td>0.4 × 4times</td>
<td>1.6</td>
<td>0.4 × 4times</td>
<td>1.6</td>
<td>—</td>
</tr>
<tr>
<td>Liquidity Enhancement Auction (④)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>134.2</td>
<td></td>
<td>129.4</td>
<td></td>
<td>▲4.8</td>
</tr>
</tbody>
</table>
Policy Recommendations

1. Coupon rate (market base by demand and supply)
   \[ r_B = \text{deposit rate of interest} + MC + \text{risk premium} \]

2. Domestic currency bonds rather than dollar denominated bonds

3. Domestic Savings should be promoted
   - Bank Deposits, Insurance (long term savings), Pension funds

4. Development of Primary market
   - Holdings of domestic banks
   - Holdings of domestic insurance and pension funds

5. Secondary market should be developed in next stage

6. Money market (short term interest rate) – Monetary policy
   - Open market operations
Thank you for your attention

Naoyuki YOSHINO
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Professor Emeritus of Keio University
References


References


Sustainable Development
Series Editors:
Parkash Chander · Euston Quah

Jeffrey D. Sachs · Wing Thye Woo
Naoyuki Yoshino
Farhad Taghizadeh-Hesary Editors

Handbook of Green Finance
Environmental Issues associated with Infrastructure

\[ Y = F (L, K_p, K_g) \]  \hspace{1cm} (1)

**Traditional Production Function**

\[ F (Y, \text{CO}_2) = F (L, K_p, K_g) \]  \hspace{1cm} (2)

Y = Output \hspace{1cm} \text{CO}_2 = \text{emission}

L = labor \hspace{1cm} K_p = \text{Private capital},

K_g = \text{infrastructure}