Environmental Risk Analysis (ERA) in the Strategic Asset Allocation (SAA) of the International Reserves (IRs) managed by Central Banks (CBs).

Torinelli, Viviane Helena Silva Jr, Antônio Francisco de Almeida da
This presentation contains academic and personal understandings, not institutional ones.
Abstract

Context: Environmental risks, associated with climatic, geologic and ecosystem factors, are resulting in a range of financial risks. ERA is still incipient in the financial investment sphere, especially among CBs;

Question: How to consider environmental risks in the Strategic Asset Allocation (SAA) of the International Reserves (IRs) managed by Central Banks (CBs)?

Method: Literature/desk review.

Deliverable: A multicriteria analytical framework is proposed for the evaluation of the environmental risk exposure of an investment portfolio, compatible with the investor profile of the CBs. The framework includes ERA in the IRs traditional SAA approach.
Scope

- Addresses climate and more broadly environmental factors (e.g.: biodiversity), but does not include social and governance factors, which are typically also included in ESG (Environmental, Social and Governance) and SRI (Socially Responsible Investing) analysis.

- According to the NGFS (2019), CBs may choose to adopt SRI to a) mitigate environmental risks in their portfolio, or b) to create a positive impact on the environment and society alongside financial returns. These objectives can be translated into different investment strategies. **This study is focused on a) a risk/return management, not in b) a positive impact investment perspective.**
## The Environmental Risk Analysis (ERA)

<table>
<thead>
<tr>
<th>ERA components:</th>
<th>Sub Components:</th>
<th>References:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transition</td>
<td></td>
</tr>
<tr>
<td>2) Scenarios analysis:</td>
<td>Climate and other physical scenarios</td>
<td>Cahen-Fourot et al (2019); Caldecott, Tilbury and Carey (2014); CISL (2015); Lamperti et al (2019); McKinsey (2020); Mercer (2011); NGFS (2020)a; NGFS (2020)b; TCFD (2017) and Scott, Huizen and Jung (2017).</td>
</tr>
<tr>
<td></td>
<td>Regulation, carbon-market and other transition ones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reputational</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Systemic</td>
<td></td>
</tr>
</tbody>
</table>

Source: prepared by the authors.
## IRs & NGFS typical CB portfolios

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Policy portfolios</th>
<th>Own portfolios</th>
<th>Pension portfolios</th>
<th>Third-party portfolios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dictated by</td>
<td>Policy goal – determined by central bank mandate.</td>
<td>Financial return goal – e.g. to help cover operating expenses.</td>
<td>Fiduciary duty – managed on behalf of beneficiaries.</td>
<td>Third-party mandate – managed on behalf of an external party.</td>
</tr>
<tr>
<td>Main objective</td>
<td>To support, implement and maintain confidence in monetary policy and currency management.</td>
<td>To generate returns within set risk tolerance levels. Secondary objective can be to gather market intelligence.</td>
<td>To provide for the retirement pension obligations of the central bank’s employees.</td>
<td>Set by a third party. Varies, e.g. financial return, short-term liquidity provision or foreign exchange intervention.</td>
</tr>
<tr>
<td>Character</td>
<td>Assets meet high standards in terms of liquidity and credit quality in order to be able to absorb shocks in times of crisis or when access to borrowing is curtailed. Can be subject to market neutrality.</td>
<td>Subject to risk-return considerations. More freedom in investment decisions, but interference with monetary policy or currency management should be prevented.</td>
<td>Long term investment horizon in line with the pension liabilities. Short-term volatility is less of a concern.</td>
<td>Depends on main objective of funds. Cases where central bank manages foreign exchange reserves on behalf of the government.</td>
</tr>
<tr>
<td>Duration</td>
<td>From short to medium term. From 3-6 years for majority. Less than 2 years for one-third of respondents.</td>
<td>Short term. Less than 2 years for majority.</td>
<td>Longer term. More than 6 years for two-thirds of the respondents.</td>
<td>Balanced. Varies from short term (0-2 years), medium term (3-6 years) and longer term (&gt; 6 years).</td>
</tr>
</tbody>
</table>

Source: prepared by the authors based on the theoretical references of this study.
Multicriteria analytical framework - ERA in the IRs Traditional SAA approach

Overview

Source: prepared by the authors based on the references of this study.
Multicriteria analytical framework - ERA in the IRs Traditional SAA approach

Highlights

1) **ERA output incorporated on the top of other main concerns of the IRs management.** ERA may provide new relevant information to the IRs traditional SAA framework. It will be considered alongside IRs economic objectives and IRs investment guidelines.

2) **Environmental risks and opportunities are considered without undermining other CB´s perspectives.** CBs can evaluate the adequacy to adjust the framework to include the environmental factor as a fourth pillar of IRs management objectives.

3) **ERA may direct the partial allocation of the IRs in green assets or indicate a rebalancing among existing assets.** ERA could measure risks and contribute to reweighting in SAA without necessarily implying any green strategy.
1.1) ERA- Environmental Risk Analysis (ERA)

### RISK IDENTIFICATION

Analysis of environmental factors in time and related financial risk metrics.

#### 1) Environmental factors:

<table>
<thead>
<tr>
<th>Physical: Climatic</th>
<th>Geologic</th>
<th>Ecosystem</th>
<th>Transition: Policy</th>
<th>Technology</th>
<th>Sentiment</th>
</tr>
</thead>
</table>

#### 2) Assessment of environmental risk in time (events and trends), based on stress testing, scenario analysis or other technique.

<table>
<thead>
<tr>
<th>Risk metrics (e.g.: decline in revenues; increase in costs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset level: OpVaR.</td>
</tr>
<tr>
<td>Asset level: Discounted Cash Flow (DCF) valuation; relative performance. Portfolio level: VaR; portfolio value under various scenarios.</td>
</tr>
<tr>
<td>Asset level: credit rating; expected loss; DCF valuation. Portfolio level: expected loss; rating level for industry; rating for securitized assets.</td>
</tr>
<tr>
<td>Financial firm’s exposure, size and concentration; system-wide losses on different scenarios.</td>
</tr>
<tr>
<td>Impact on GDP, consumption, financial conditions (scenarios, macro models and model based).</td>
</tr>
</tbody>
</table>

#### 3) Measures for assessment value and risks in each impact dimension:

<table>
<thead>
<tr>
<th>Financial:</th>
<th>Systemic:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business:</td>
<td>Financial System:</td>
</tr>
<tr>
<td>Market:</td>
<td>Economy-wide:</td>
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#### RISK ANALYSIS: EXPOSURE AND ASSESSMENT OF IMPACTS AND PROBABILITIES

Translating env. factors into measured financial risks (e.g.: transmission channels; general picture of scale and scope; proxies; stress testing, scenario analysis, portfolio and probabilistic modelling etc.)

Source: adjusted by the authors based on the references from this study, mainly Bank of England, UNEP Enquiry and CISL (2017).
## 1.2) IRs Traditional SAA Framework

**Concern for crises mitigation**

**IR economic objectives** (Fender et al, 2019)
- Intervention in the FX markets;
- Execution of payments for goods and services;
- Execution of payments for the government;
- Granting of emergency liquidity assistance;
- Support of domestic monetary policy;
- Underpinning of investor confidence in the country;
- Investment of excess reserves

**Investment Guidelines**
- Investment Policy;
- Investment Strategy;
- Investment Driver;
- Investment Objectives

**Pillars of investment**
- Environmental Sustainability
- Profitability
- Liquidity
- Security

**IRs focus (main exposure)**
- **Currency:** mainly USD, EUR, CNY, JPY, GBP.

**SAA model approaches**
- Mean-variance optimization (MVO), Factor risk allocation, Total Portfolio Analysis, Dynamic asset allocation, Liability driven asset allocation and Regime Switching Models

## 2) Environmentally Adjusted SAA Framework for IR management

**ERAs Traditional SAA Framework**

**Source:** prep. by the authors based on the ref. of this study, mainly Fender et al (2019) and IMF (2001).

**ERAs Environmentally Adjusted SAA Framework for IR management**

**E.g.: climate crisis**

**New relevant info to be considered**

**SRI**:
- a) mitigate environmental risks in their portfolio;
- b) to create a positive impact on the environment and society alongside financial returns.

**ERA outputs:** estimated financial impacts and probabilities of environmental physical and transition risks

**Concern for crises mitigation**
- Countercyclicity

| Source: prep. by the authors based on the ref. of this study, mainly Fender et al (2019) and IMF (2001). |
3) Practical possible ERA impacts on IR´s SAA

1) Inclusion of new asset alternatives:
   1.1) Inclusion of Green Asset Classes (eg: Green Bonds, Green Funds, Green Indexes in passive portfolios etc);
   1.2) Inclusion of other asset alternatives, as unlisted funds, if appropriate for the environmentally adjusted SAA framework;

2) Rebalance among existing asset classes, regions/countries, sectors and sub asset classes:
   2.1) Divestments from high carbon footprint and/or high temperature alternatives;
   2.2) Investments to explore opportunities towards lower carbon footprint and/or lower temperature;
   2.3) Migration to assets less correlated with the environmental risks to be mitigated;

3) Inclusion of environmental risk management considerations in the selection of asset managers, fund managers and companies.
Practical exercise

<table>
<thead>
<tr>
<th>CB from Latin America (Brazil):</th>
<th>US$ billion in 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR</td>
<td>356.89</td>
</tr>
<tr>
<td>GDP</td>
<td>1,839.80</td>
</tr>
<tr>
<td>% IRs/GDP</td>
<td>19%</td>
</tr>
<tr>
<td>Total merchandise exports</td>
<td>222.64</td>
</tr>
<tr>
<td>% IRs/Exports</td>
<td>160%</td>
</tr>
<tr>
<td>Food &amp; agriculture raw material exports</td>
<td>88.83</td>
</tr>
<tr>
<td>% food &amp; agriculture on total exports</td>
<td>40%</td>
</tr>
<tr>
<td>Fuel exports</td>
<td>30.50</td>
</tr>
<tr>
<td>% fuel on total exports</td>
<td>14%</td>
</tr>
<tr>
<td>% IR assets allocated to hedge sudden stops in capital flows (ARA IMF - exports)</td>
<td>5%</td>
</tr>
<tr>
<td>Total IR assets allocated to hedge of the external liabilities</td>
<td>11.13</td>
</tr>
<tr>
<td>40% hedge for food &amp; agriculture on total exports</td>
<td>4.44</td>
</tr>
<tr>
<td>14% hedge for fuel on total exports</td>
<td>1.53</td>
</tr>
</tbody>
</table>
Practical exercise: ERA-SAA Integration

- **Environmental factors**: climatic transition (CO2 emissions), in policy, technology & sentiment/reputational dimensions + physical climatic impacts (temperature and precipitation, with extreme events);
  
  **Economic sectors**: energy + food & agriculture;
  
  **Scenarios**: NGFS Climate Scenarios for central banks and supervisors (2020);

- **Environmental risks with financial impacts**: "increased CO2 emission cost" and "crop break due to physical climate impacts";

- **Possible related asset price movements**: stranded-assets in the O&G sector; appreciation of clean energy assets; decrease non-regenerative agriculture average asset prices; increase biodiversity conservation asset-related prices; exports and foreign exchange rate impacts etc;

- **SAA**: hedge to ERA-related asset price movements, considering also other traditional SAA relevant data (e.g.: IR economic objectives; investment guidelines and investment pillars);

- **Migrate to assets less correlated with agricultural and oil commodities** (example of relevant scenario to be mitigated).
Conclusion

• The main argument is that ERA should be included in the traditional approach for SAA in CBs.

• Each viable portfolio should also be evaluated based on an ERA, considering scenarios of environmental risks along probabilities and potential impacts.

• The risk and return relationships of the portfolios in each scenario should be evaluated based on the environmental physical and transition factors.

• In addition to traditional IR framework, the CBs should also take environmental risk into account.
Limitations and further studies

- This study only addresses the Environmental aspects of the ESG factors.
- Also, this research focus is the environmental and financial risk management, not the non-financial investment objectives as “to create a positive impact on the environment and society alongside financial returns” (NGFS, 2019).
- Further studies could focus on Social and Governance factors, as well as on the non-financial investment objectives under an IRs management perspective.
Second Article

Joint initiative with CEMLA: discuss and analyze the application of the framework and its implications for LAC (10 selected countries).

Method: questionnaire + interviews/meetings + desk review;

Schedule 2021:
- Questionnaire: Jan/Feb/Mar;
- Interviews/Meetings: April/May;
- Desk Review: Jan-May.

Environmental risk management of the international reserves: an applied framework discussion with the Central Banks from Latin America and the Caribbean

ABSTRACT:

This is an applied framework discussion with central banks (CBs) from Latin America and the Caribbean (LAC) regarding the environmental risk management (ERM) of the international reserves (IRs). This study is based on a sample of CBs from LAC, taking into consideration the national exports of the respective countries, the risk of sudden stops in capital flows and the IRs’ economic objectives. Commodities are economically relevant for all analyzed countries. The specific environmental risk exposures are discussed, as are the alternatives to ERM through the IRs’ strategic asset allocation (SAA). The framework discussed herein includes environmental risk analysis (ERA) in the IRs’ traditional SAA approach. As a result, IRs investments can become more resilient to environmental and climate risk exposure.
Portfolio optimization with resilience to environmental risks: international reserves and central banks in focus.

ABSTRACT:

This article presents the portfolio optimization under the scope of an environmental risk management of the international reserves by central banks. This is the third article of a series. In the first one it was proposed a framework for environmental risk management of the international reserves. The second article discussed the application of the framework to a sample of central banks from Latin America and the Caribbean. This third article presents a risk/return analysis of the applied framework, including specific asset alternatives and portfolios. As a results of the application of this study, portfolios may be more resilient to environmental risks.
Thank You!

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Viviane Helena Torinelli – Short Bio

Corporate Governance Professional

- 20 years of experience in corporate governance in the public and private sectors, including areas of risk management and compliance, internal and external auditing, M&A, due diligence and controller’s office, in Brazil and abroad. Analyst at the Central Bank of Brazil;
- Member of the Research and Innovation Committee of the Green Finance Program for Brazil- UK; Member of the Chamber of Innovation for Sustainability of the Salvador Panel on Climate Change- R100 and C40;

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