

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

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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)

ERA components:	Sub Components:	References:
1) Environmental risk factors:	Physical	Bank of England, UNEP and CISL (2017); Campiglio et al (2018); CISL (2016); Dafe and Volz (2015); IPCC (2013 and 2014); FTSE Russel (2019); Moody's (2016); Scott, Huizen and Jung (2017); Volz (2017); WRI and UNEP-FI (2015).
	Transition	
2) Scenarios analysis:	Climate and other physical scenarios	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).
	Regulation, carbon-market and other transition ones	
3) Risk assessment tools in each impact dimension:	Financial (business, market and credit)	Battiston and Monasterolo (2019); Bank of England (2020); Bank of England, UNEP and CISL (2017); Benedetti et al (2019); Bolton et al (2020); CISL (2016); CISL (2015); Dietz et al (2016); G20 GFSG (2016 and 2017); Moody's (2016); NGFS (2020)c; NGFS (2020)d; UNEP-FI (2019); WWF (2017).
	Reputational	
	Systemic	

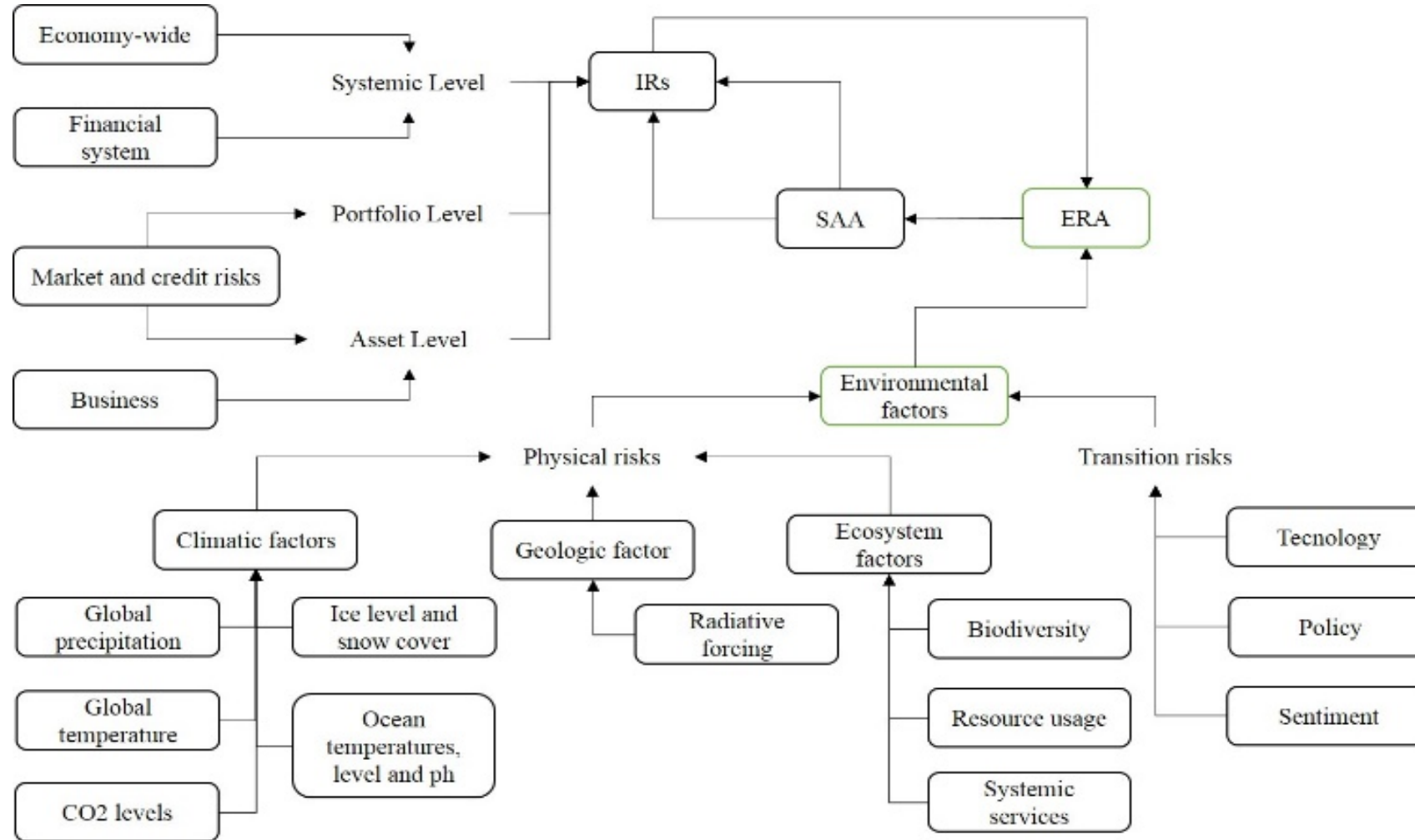
Source: prepared by the authors.

IRs & NGFS typical CB portfolios

Characteristics	Policy portfolios	Own portfolios	Pension portfolios	Third-party portfolios
Dictated by	Policy goal – determined by central bank mandate.	Financial return goal – e.g. to help cover operating expenses.	Fiduciary duty – managed on behalf of beneficiaries.	Third-party mandate – managed on behalf of an external party.
Main objective	To support, implement and maintain confidence in monetary policy and currency management.	To generate returns within set risk tolerance levels. Secondary objective can be to gather market intelligence.	To provide for the retirement pension obligations of the central bank's employees.	Set by a third party. Varies, e.g. financial return, short-term liquidity provision or foreign exchange intervention.
Character	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.	Subject to risk-return considerations. More freedom in investment decisions, but interference with monetary policy or currency management should be prevented.	Long term investment horizon in line with the pension liabilities. Short-term volatility is less of a concern.	Depends on main objective of funds. Cases where central bank manages foreign exchange reserves on behalf of the government.
Asset classes	Limited. Mostly (sub-) sovereigns, supnationals and agency (SSA) and some corporate/covered bonds and equity.	Diverse. Mix between SSA, corporate/covered bonds and equity, and potentially private debt.	Diverse. Mix between SSA, corporate/covered bonds, equity, and private debt.	Diverse. Mainly SSA, followed by corporate/covered bonds, and equity.
Duration	From short to medium term. From 3-6 years for majority. Less than 2 years for one-third of respondents.	Short term. Less than 2 years for majority.	Longer term. More than 6 years for two-thirds of the respondents.	Balanced. Varies from short term (0-2 years), medium term (3-6 years) and longer term (> 6 years).

Source: NGFS (2019)b.

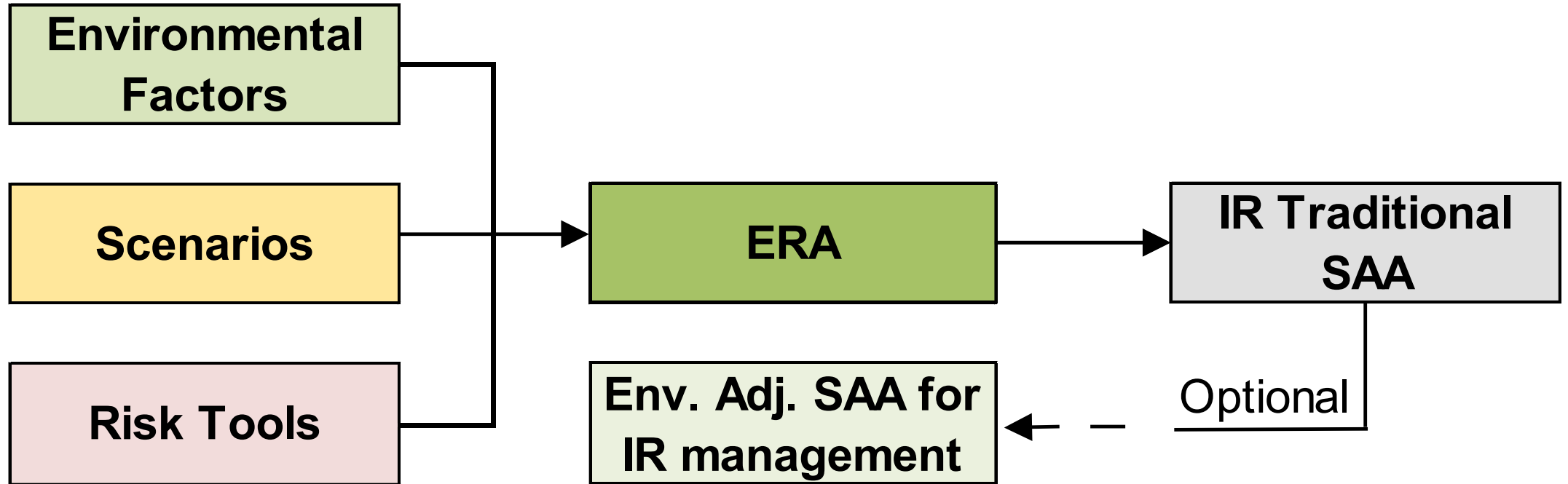
Concept map



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:			3) Measures for assessment value and risks in each impact dimension:				
			Financial:			Systemic:	
			Business:	Market:	Credit:	Financial System:	Economy-wide:
Physical: Climatic Geologic Ecosystem	2) Assessment of environmental risk in time (events and trends), based on stress testing, scenario analysis or other technique.	Risk metrics (e.g: decline in revenues; increase in costs)	Asset level: OpVaR.	Asset level: Discounted Cash Flow (DCF) valuation; relative performance. Portfolio level: VaR; portfolio value under various scenarios.	Asset level: credit rating; expected loss; DCF valuation. Portfolio level: expected loss; rating level for industry; rating for securitized assets.	Financial firm's exposure, size and concentration; system-wide losses on different scenarios.	Impact on GDP, consumption, financial conditions (scenarios, macro models and model based).
Transition: Policy Technology Sentiment							

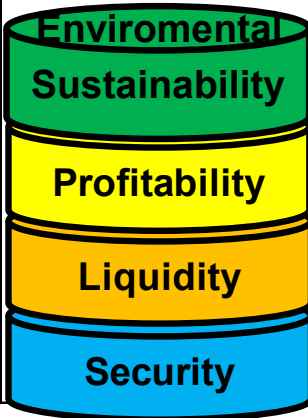
RISK ANALYSIS: EXPOSURE AND ASSESSMENT OF IMPACTS AND PROBABILITIES

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.)

1.2) IRs Traditional SAA Framework

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

2) Environmentally Adjusted SAA Framework for IR management

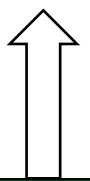
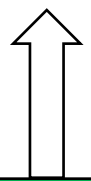
IR economic objectives (Fender et al, 2019)	Investment Guidelines	Pillars of investment	IRs focus (main exposure)	SAA model approaches	Concern for crises mitigation
Intervention in the FX markets; Execution of payments for goods and services; Execution of payments for the government; Granting of emergency liquidity assistance; Support of domestic monetary policy; Underpinning of investor confidence in the country; Investment of excess reserves	Investment Policy; Investment Strategy; Investment Driver; Investment Objectives		Asset: mainly Treasury Bonds, Supranationals, Sovereign Eurobonds, US Agencies, Inflation Protected Bonds, Corporates, MBS/ABS, Covered Bonds, Banks Debt and Green Bonds. Currency: mainly USD, EUR, CNY, JPY, GBP.	Mean-variance optimization (MVO), Factor risk allocation, Total Portfolio Analysis, Dynamic asset allocation, Liability driven asset allocation and Regime Switching Models	Countercyclicality

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

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

New relevant info to be considered

E.g.: climate crisis



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

CB from Latin America (Brazil):	US\$ billion in 2019
IR	356.89
GDP	1,839.80
% IRs/GDP	19%
Total merchandise exports	222.64
% IRs/Exports	160%
Food & agriculture raw material exports	88.83
% food & agriculture on total exports	40%
Fuel exports	30.50
% fuel on total exports	14%
% IR assets allocated to hedge sudden stops in capital flows (ARA IMF- exports)	5%
Total IR assets allocated to hedge of the external liabilities	11.13
40% hedge for food & agriculture on total exports	4.44
14% hedge for fuel on total exports	1.53

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

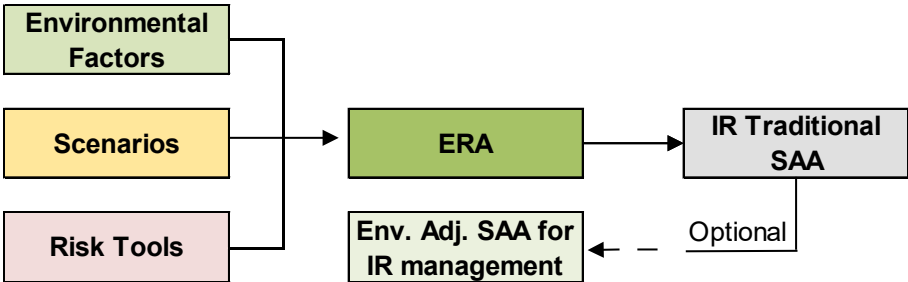
Joint initiative with CEMLA: discuss and analyze the application of the framework and its implications for LAC (10 selected countries).

Method: questionnaire + interviews/meetings + desk review;

Schedule 2021:

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

Paper submitted for publication: Sep2021.



Second Article

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.

Third Article (ongoing)

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;
- Approved PMP, 2013; CISA, 2007; Six Sigma Green Belt, 2007; CIA, 2006.

Sustainable Finance PhD Candidate

- PhD candidate with an ESG focus on the management of international reserves by central banks (NPGA-UFBA) – progression from MSc in 2017. MBA in Project Management, 2009; Business in UFPR / Universitat Passau, 2004.
- *Climate Risk and Sustainable Finance* - SOAS London, 2020; *Sustainable Finance Course* – SSEE, University of Oxford, 2019.
- *PRI Academic Network Conference* and *PRI in Person*, 2019; Engema- FEA USP, 2019 and 2020; CEMLA México, 2019 and 2020; GRASFI Conference PhD Workshop 2019 and 2020.

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