

Capitalizing the CRF

Engaging with Donors/Investors

28 June 2022

Executive Overview

Objective

Remove the asymmetric information between sustainable bond issuers and capital market intermediaries

Solution Approach

Develop a dynamic, data-driven tool to enable ECLAC and partners to understand probable bond pricing for any sustainable bond design scenario and the bond design elements associated with the predicted pricing

Key Value Proposition

Enable more intelligent decision making related to debt financing design and underwriting to minimize the total cost of capital for the Caribbean Resilience Fund (CRF) and related entities

Sustainable Debt, Standardized Thematic Investment Categories

Sustainable Debt Thematic Areas	Description	Eligibility & Measurement Considerations
Green	<p>Dedicated environmental benefits; All net proceeds must verifiably meet Climate Bonds' green definitions derived from the Climate Bonds Taxonomy</p> <p>Eligible project and asset types include: Renewable Energy (e.g. wind, solar, geothermal) Energy Efficiency (e.g., building efficiency, energy storage), Pollution Prevention and Control (e.g., waste recycling, soil remediation), Environmentally Sustainable Management of Natural Resources & Land Use (e.g., sustainable agriculture, reforestation) Terrestrial and Aquatic Biodiversity (e.g., coastal protection), Clean Transportation (e.g., infrastructure for clean energy transport) Climate Change Adaptation (e.g, climate observation and early warning systems), Green Buildings (work to meet environmental performance standard)</p>	Bonds issued in line with the Green Bond Principles (GBP) from the International Capital Market Association (ICMA); certification available from Climate Bonds initiative (CBI)
Social	Dedicated social benefits; e.g., pandemic, COVID-19, housing, gender, women, health, education, etc.	Bonds issued in line with Social Bond Principles (SBP) from ICMA; certification available from Climate Bonds initiative (CBI)
Sustainability	Combination of green and social projects, activities, or expenditures, e.g., sustainable; Sustainable Development Goal (SDG); socially responsible investment (SRI); or environmental, social and governance (ESG)	Bonds issued in line with Sustainability Bond Principles (SBP) from ICMA; certification available from Climate Bonds initiative (CBI)
Sustainability Linked	<i>Coupon step-up / step-downs linked to entity level sustainability performance targets; linked to not meeting/meeting pre-defined, time bound SPTs at the entity level.</i>	<i>Bonds issued in line with the Sustainability-Linked Bond Principles (SLBP) for ICMA</i>

ICMA Sustainable Bond Principles Overview



Evidence Based Approach for Accurate Asset Pricing

Key Insight from Literature Review

“The mean (median) forecasting performance of the Random Forest Regression is substantially higher than that of the linear regression models and neural networks; furthermore, the forecasting performance of the random forest exhibits a smaller standard deviation.”

Improving CAT Bond Pricing via Machine Learning

Tobias Götze, et al., Department of Finance, Braunschweig Institute of Technology, Brunswick, Germany

Key Research Findings

1. **Reduced Bias:** Random Forests train nodes on different subsets of training data set, selecting a random subsample of variables guaranteeing that trees are de-correlated and less prone to overfitting
2. **Increased Robustness:** Random Forests are invariant to scaling and various other transformations of variable values and robust to the inclusion of irrelevant variables
3. **Higher Predictive Accuracy:** Random Forests have reduced variance by averaging across uncorrelated trees, leading to better forecasting performance.

Random Forest Algorithm, Design Overview

Training Data Set:

2,200 Sustainable Bond Issuances (Green, Social, Sustainable) issued since 2015

Algorithm Parameters:

Target Variable: G-Spread: Nominal spread, or the spread over the exact interpolated point (duration) on the Treasury curve as the reference security

Independent Variables:

Duration	Security Type
Coupon Type	S&P Rating
Bond Yield	Sector
Issuance Amount	<i>Covenant Conditions</i>
2 Year T-Bill Yield	Negative Pledge
Security Type	Change of Control
Listing Venue	Negative Covenant
Coupon Yield	Restriction of Activities
Issue Price	Restrictive Covenant

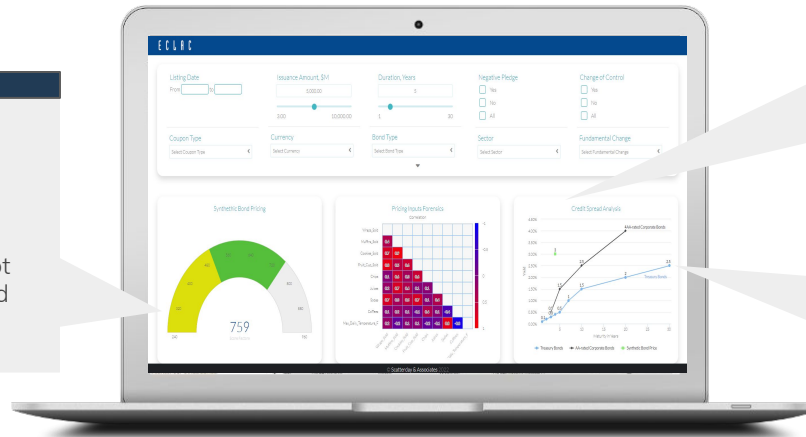
Other Industry Use Cases

- **Equity Asset Pricing** for Investment Banking
- **Loan Default Prediction** Retail Banking
- **Product Recommendation** and **NPS Prediction** for Digital Retailers

Synthetic Bond Pricing Tool, User Interface Proposal

Module 1: Synthetic Bond Pricing

Understand probable coupon yield spread for a given hypothetical debt instrument given user-selected bond design inputs



Module 2: Pricing Inputs Forensics

Understand the key drivers behind the user-generated synthetic bond pricing / coupon yield

Module 3: Credit Spread Analysis

Understand synthetic bond pricing relative to key government and corporate debt benchmarks

Prediction Case Study, Green Bond

Parameter	Value
Issuer	ENEL FINANCE INTERNATIONAL N.V.
ISIN	XS2066706735
Duration	15
Coupon Type	Fixed
Coupon Yield	1.17
Price	98.92
Issuance Amount	\$500,000,000
Currency	EUR
Bond Type	EURO MTN
Rank	Senior Unsecured
Bond Rating (S&P)	BBB+
Sector	Utilities
Listing Date	10/17/19
Restrictive Covenant	Y
Negative Covenant	Y
Restriction of Activities	Y
Negative Pledge	Y
Change in Control	N
Nominal Spread (G-Spread)	241 bps

Bond Indenture Provisions

Key Indenture Provisions	Definitions
Restrictive Covenant	Umbrella categorization that restricts the issuer in an enforceable agreement.
Negative Pledge	Prohibits an issuer from creating any security interests over subject asset specified in the provision.
Restriction of Activities	Provisions that limit use of proceeds on defined sets of activities
Negative Covenant	Provision that restricts a company from engaging in certain actions. For example, the negative covenant may restrict the ability of the firm to issue additional debt.
Change of Control	Allows bondholders to put (sell) their bonds back to the company at 101% of par value when a specified event has changed the ownership/control of the company.
Fundamental Control	In the case of a specified takeover-related event occurs, bondholders will either have the right to 'put' their bonds back to the company, or to have the interest rate on their bonds increased to reflect the additional risk associated with the takeover-related event
Limit of Indebtedness	Prohibits any additional debt that may be incurred by the issuer
Cross Default	Provision that puts a borrower in default if the borrower defaults on another obligation.
Debt Service Coverage Ratio	Provision that requires issuers to maintain a pre-agreed ratio of cash flows for debt service costs
Collective Action Clause	Provisions that enable a supermajority of bondholders to agree to a debt restructuring that is legally binding on all holders of the bond

Thank you

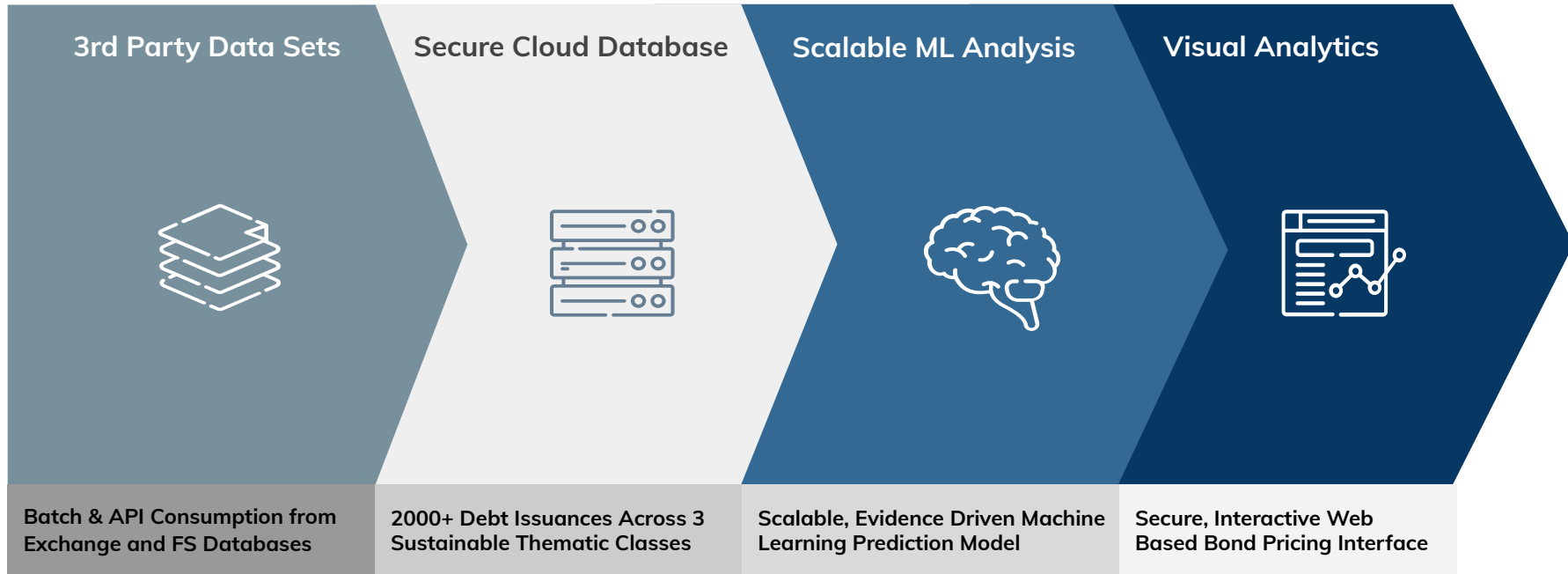
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Appendix

Random Forest Regression Algorithm, Solution Overview



Technology Roadmap: Planning Incremental Value Delivery

Feature Name	Feature Description	Priority
“Look-a-Like” Debt Instrument Lookup	Enable historical search for sustainable debt instruments with similar fundamental characteristics to a reference security.	High
Total Financing Costs	Net present value calculation for all-in financing costs for any hypothetical bond issuance	High
Algorithm Prediction Library	Self-service selection of various machine learning approaches to predict selected output variable	Medium

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Credit Spread Analysis, Look-a-Like Analysis, Social Bonds

Issuer	ISIN	Class	Coupon	Duration	Rank	Amount (USD \$M)	Issuing Currency	Listing Date	Credit Rating (S&P)	Credit Rating (Sov)	G Spread	Avg Spread
European Union	EU000A3K4DE6	Social	Fixed	15	Senior Unsecured	2,400	EUR	3/22/2022	AA+	NA	79	95
African Development Bank	XS2475194671	Social	Fixed	15	Senior Unsecured	52	EUR	4/25/2022	AAA	NA	103	
International Finance Corp	AU3CB0271914	Social	Fixed	15	Senior Unsecured	634	AUD	4/06/2020	AAA	NA	102	
Chile Government International Bond	XS2369244327	Social	Fixed	15	Senior Unsecured	886	EUR	7/21/2021	A	A	259	314
Peruvian Government International Bond	XS2408608219	Social	Fixed	15	Senior Unsecured	1,131	EUR	11/10/2021	BBB	BBB+	368	

Core Liability Sovereign Management Operations Objectives

1

Improve the predictability of the financial needs for subject jurisdictions via proactive and strategic cash management

2

Develop an optimal balance-sheet structure considering liquidity and cost by defining an ideal financial asset and liability portfolio and actively managing it over time

3

Develop the public debt securities market enabling subject jurisdictions to issue debt at lower/optimal costs of capital aligned with funding timelines

4

Maintain a financing plan to manage potential stress and contingency scenarios, primarily those related to external shocks

Fixed Income Risk Classes

Rollover/refinancing Risk: Negative or declining refinancing ability or a certain debt exposure at maturity due to, e.g., loss of market access or low investor appetite

Market Risk: Negative movements in interest rates (interest rate risk) and exchange rates (exchange rate risk)

Funding Liquidity Risk: Possible difficulty of the sovereign to raise funds through borrowing in a short period of time to service the debt on the due date, and (ii) market liquidity risk, which refers to the risk that the investor faces from a quick diminishing of the trading volume of a bond or a series of bonds in the secondary market due to, e.g., abrupt changes in economic fundamentals or unanticipated cash flow obligations

Credit Risk: A sovereign's own credit risk *(and a counterparty's ability to fulfill its obligations)*

Legal Risk: A range of uncertainties related to legal actions or legal shortcomings to the applicability or interpretation of contracts, laws, and regulations

Contingent Risk: The potential financial claims against the government under certain circumstances

Operational Risk: A range of risks, stemming from transaction errors, failures in internal controls and systems, legal shortcomings, security lapses, or natural disasters

Liability Management Operations (LMOs) enable smooth implementation of a country's debt management strategy and structural mitigation of downside sovereign debt risks

Liability Management Operations Used by Debt Managers

Risk	Liability Management Operations
Refinancing Risk / Rollover Risk	<ul style="list-style-type: none"> ● Smooth maturity profile by well-planned primary market issuance ● Regular use of buybacks and exchanges to reduce size of large individual maturities ● Use of amortizing bonds/debt
Funding Liquidity Risk & Market Liquidity Risk	<p>Funding liquidity risks:</p> <ul style="list-style-type: none"> ● Use of cash buffers and contingency credit lines <p>Market liquidity risk:</p> <ul style="list-style-type: none"> ● Issuance in key maturity segments; concentrate on small number of instrument types; transparency to reduce uncertainty ● Use of market makers and securities lending facilities
Interest Rate Risk	<ul style="list-style-type: none"> ● Targets for issuance of fixed/floating rate instruments in primary market issuance ● Interest rate derivatives to change interest rate structure and duration ● Changes in portfolio composition to manage interest rate sensitivity
Exchange Rate Risk	<ul style="list-style-type: none"> ● Limits for overall foreign exchange risk and benchmark portfolio composition ● Well-structured primary market issuance ● Use of bond exchanges to achieve a targeted mix of local and foreign currency in the debt portfolio