

Corporate Risk Analysis: Leveraging Alternative Models and Data

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April, 2023

Agenda

Presentation

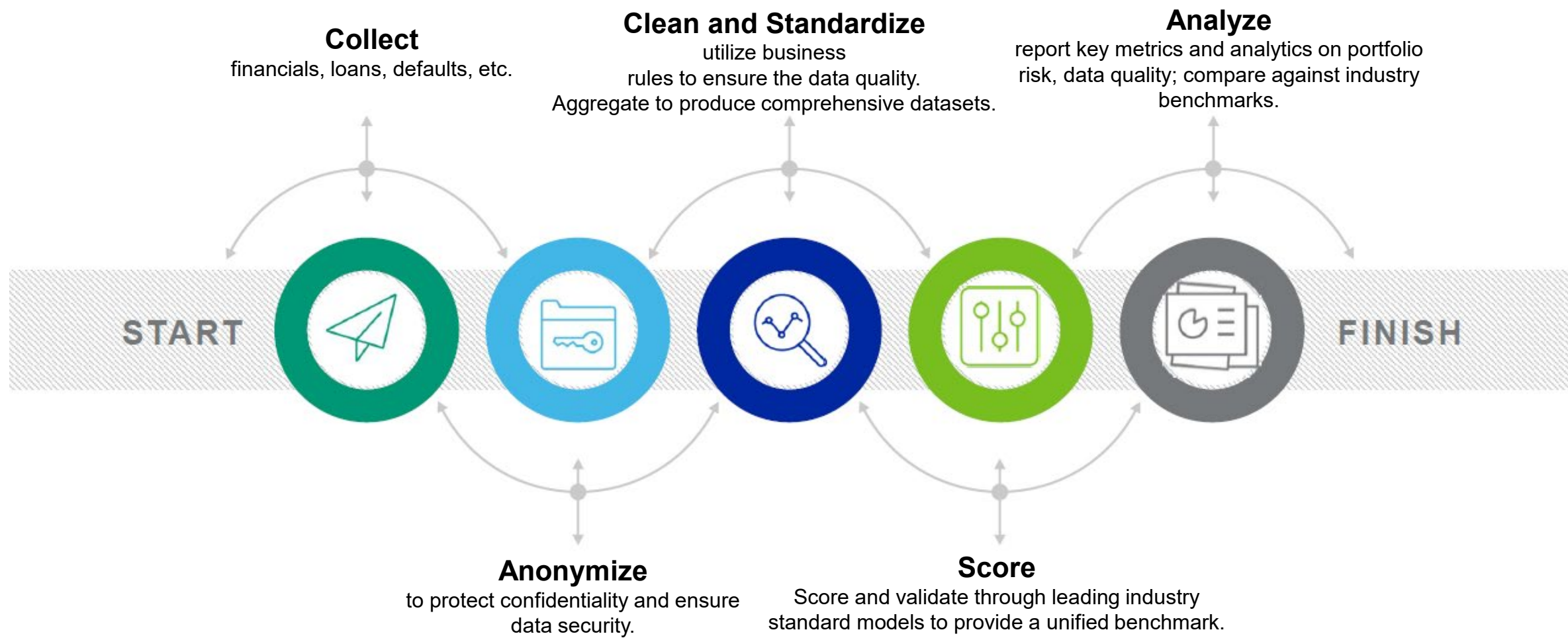
1. The Power of Well-Calibrated Models
 - Anonymized Consortium Data
 - Country-Specific Models
2. The Importance of Portfolio Benchmarking
 - Portfolio Building
 - Relevant Credit Drivers
 - Peer Comparison
3. Using Additional Data
 - Macroeconomic Indicators and Scenarios
 - ESG and Climate Risk Indicators

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The Power of Well-Calibrated Models

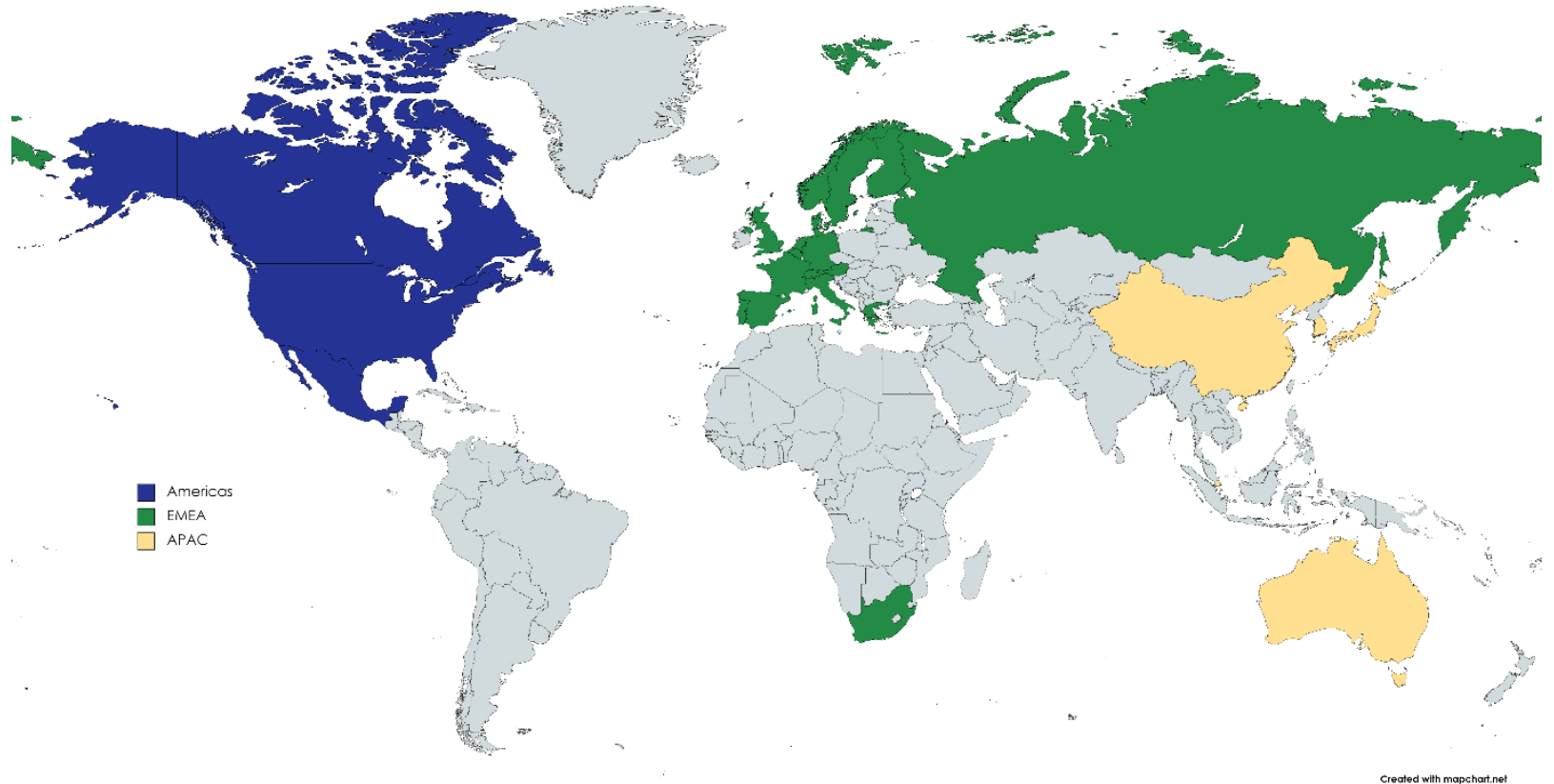
Using anonymized consortium data

Of unlisted companies for high relevance and accuracy



To build country-specific models

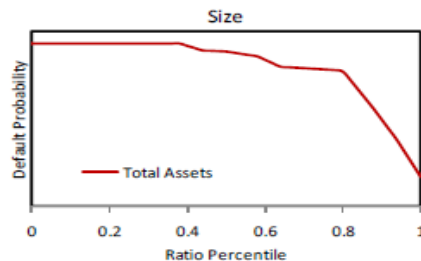
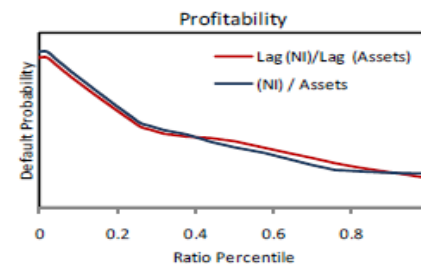
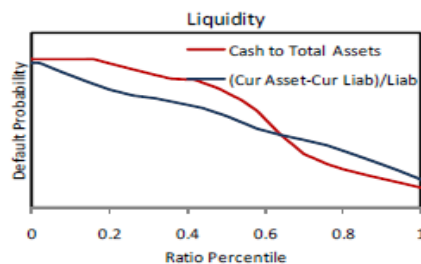
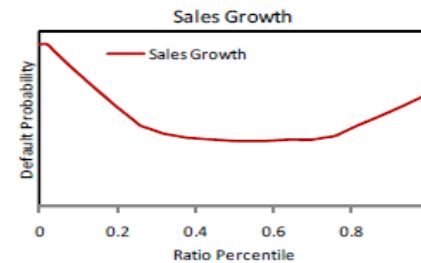
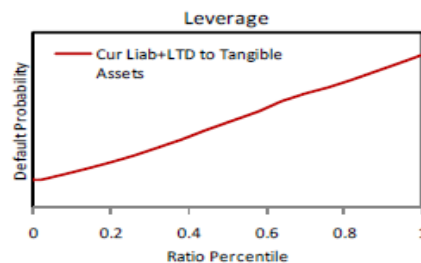
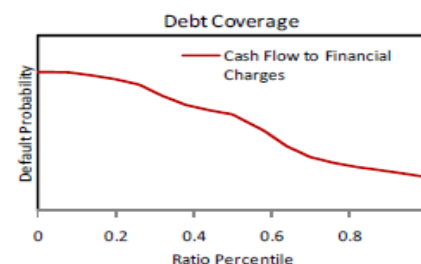
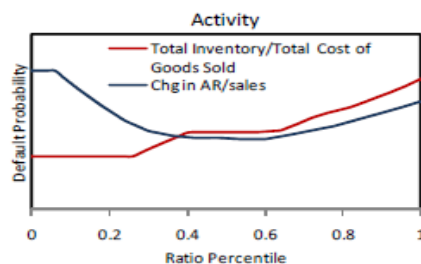
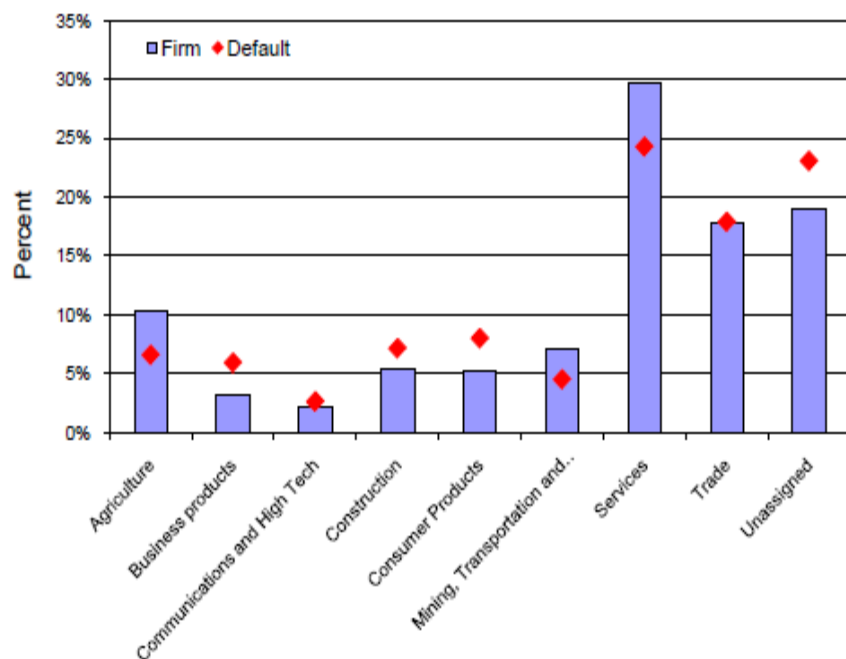
- » Reflect domestic default trends and associated financial ratios
- » Adjust for sector and firm size
- » Regional models also useful to reflect similarities
- » Produce most accurate and relevant probabilities of default
- » Possibility to translate into ratings which are comparable across sectors and countries



Example of South Africa

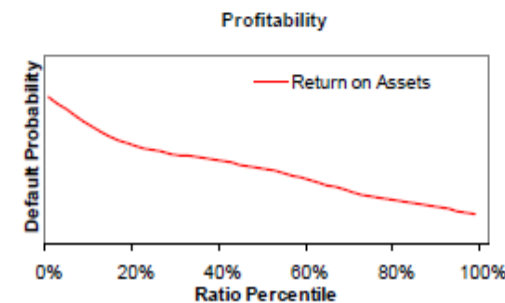
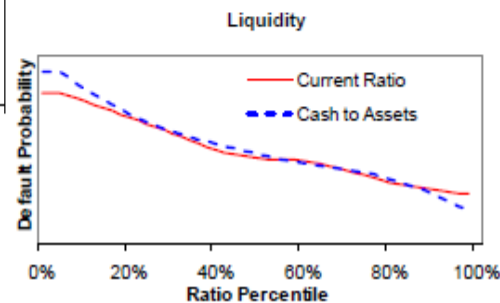
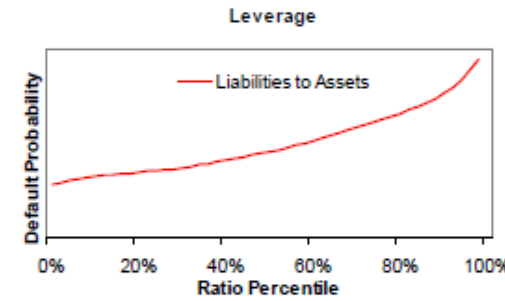
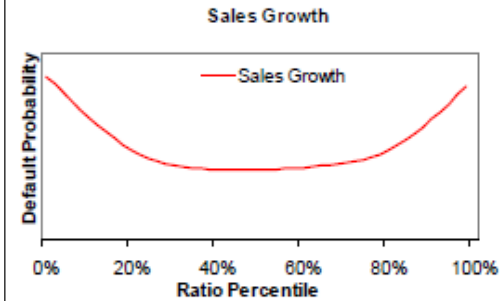
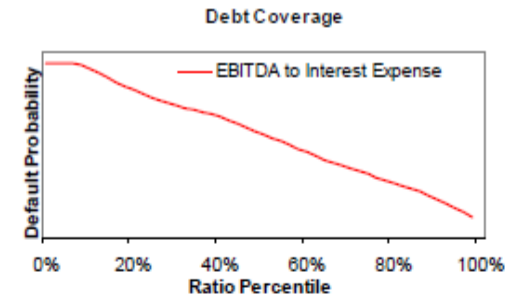
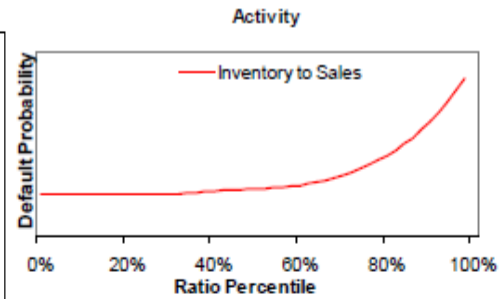
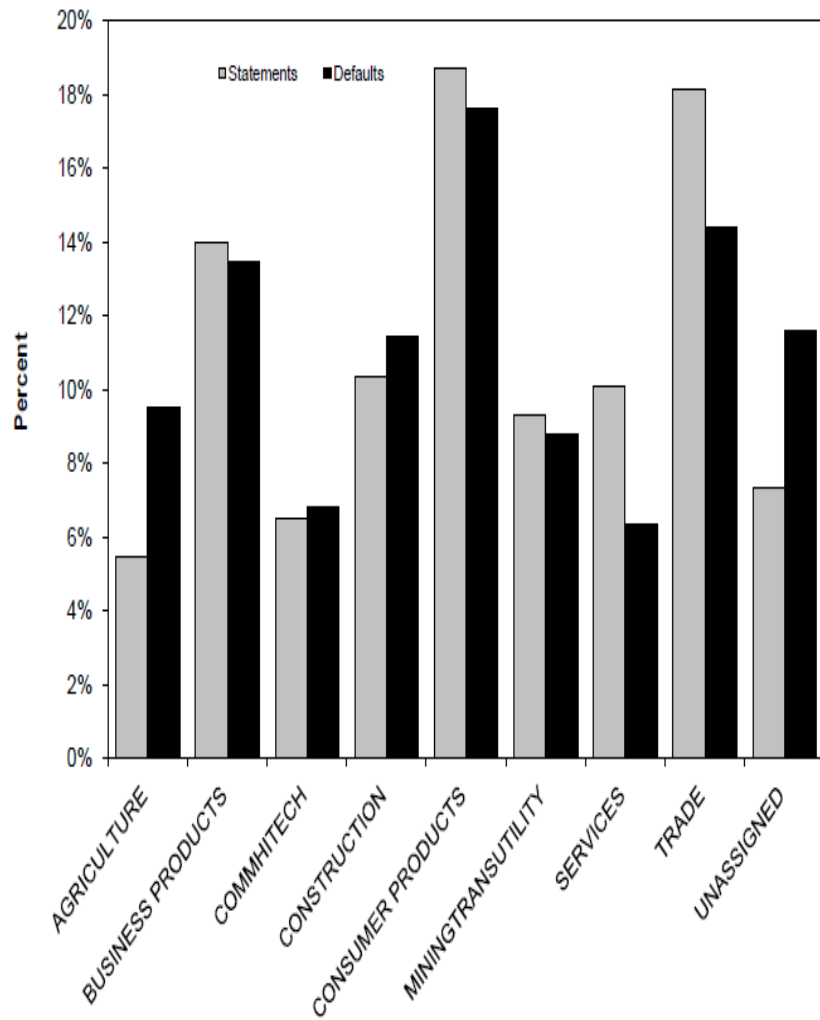
Data Profile:

- » Private Middle Market Firms
- » Financial Statements & Loan Accounting Data
- » Using local Basel compliant criteria for default



Risk Drivers	Weight
Activity	21.79%
Inventories to Cost of Goods Sold	
Change in Account Receivable to Sales	
Debt Coverage	7.90%
Cash Flow to Financial Charges	
Growth	8.87%
Sales Growth	
Leverage	14.36%
[Current Liabilities + Long Term Debt] to Tangible Assets	
Liquidity	26.36%
Cash to Total Assets	
(Current Asset - Current Liability)/Total Liability	
Profitability	16.74%
ROA	
Previous Year ROA	
Size	3.98%
Real Total Assets	

Example of Emerging Markets













CATEGORY	WEIGHTS: 1-YEAR
Activity	11.71%
Debt Coverage	18.61%
Growth	9.45%
Leverage	18.69%
Liquidity	18.71%
Profitability	19.14%
Size	3.70%

2

The Importance of Portfolio Benchmarking

How to build a portfolio

- » Select companies using a set of criteria:
 - » South Africa
 - » South Africa PD model
 - » Private companies

Company ID	Company Name	Industry	Early Warning Signal ↓	Early Warning Signal Change	1-year PD	1-Year PD YoY Change (bps)	PD Implied Rating	PD Peer Distribution
<input type="checkbox"/> GBFC034424	Everglen Capital (Proprietary) Limited	N/A	■ Medium	Deteriorated	1.76%	+13 ↑	Ba3	
<input type="checkbox"/> ZA199701225106	TWK Investments Limited	BUSINESS PRODUCTS WHS	■ Medium	Deteriorated	0.88%	+27 ↑	Ba1	
<input type="checkbox"/> ZA195400189306	Steinhoff Investment Holdings LTD	BUSINESS SERVICES	■ Low	Improved	0.79%	-34 ↓	Ba1	
<input type="checkbox"/> ZA201838890606	Liberty TWO Degrees Limited	BUSINESS SERVICES	■ Low	Improved	1.12%	-0 ↓	Ba2	
<input type="checkbox"/> ZA199801243506	BKB LTD	BUSINESS SERVICES	■ Low	No Change	0.75%	-0 ↓	Ba1	
<input type="checkbox"/> ZA201954729206	Runway Property Group Limited	BUSINESS SERVICES	■ Low	Improved	0.69%	-0 ↓	Ba1	
<input type="checkbox"/> ZA202011387706	Gaia Renewables 1 Limited	BUSINESS SERVICES	■ Low	No Change	0.57%	-0 ↓	Baa3	
<input type="checkbox"/> ZA199601762906	Agribel Holdings Limited	BUSINESS SERVICES	■ Low	No Change	3.76%	-1 ↓	B2	
<input type="checkbox"/> ZA30723KS	City of Johannesburg Metropolitan Municipality	BUSINESS SERVICES	■ Low	No Change	0.74%	-0 ↓	Ba1	
<input type="checkbox"/> ZA201114310006	CA Sales Holdings Limited	BUSINESS SERVICES	■ Low	No Change	0.23%	0 —	Baa1	

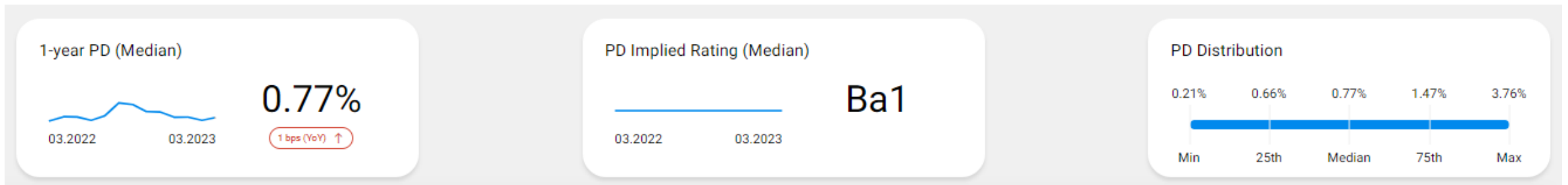
To track relevant credit drivers

At the portfolio level

12-mth Pit PD

Rating mapped to the Pit PD

Portfolio PD distribution



To track relevant credit drivers

At the obligor level

1-Year PiT PD
0.88%

27 bps (YoY) ↑

As of Mar 01, 2023

1-Year PiT PD Implied Rating
Ba1

1 Notch Down (YoY)

1-Year PiT PD Peer Group Median
2.60%

40 bps (YoY) ↑

As of Mar 01, 2023

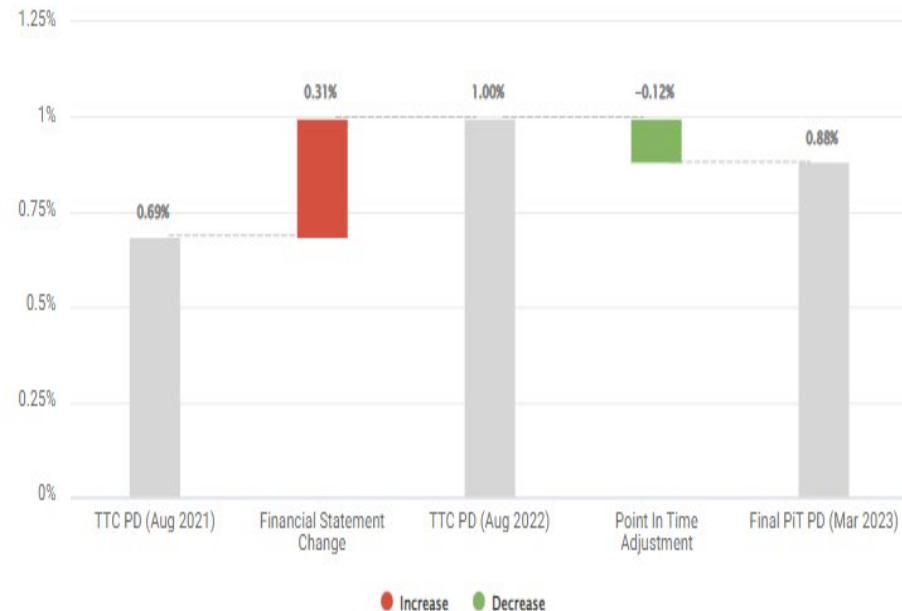
Peer Group Median
B1

1 Notch Down (YoY)

PiT vs TTC PD

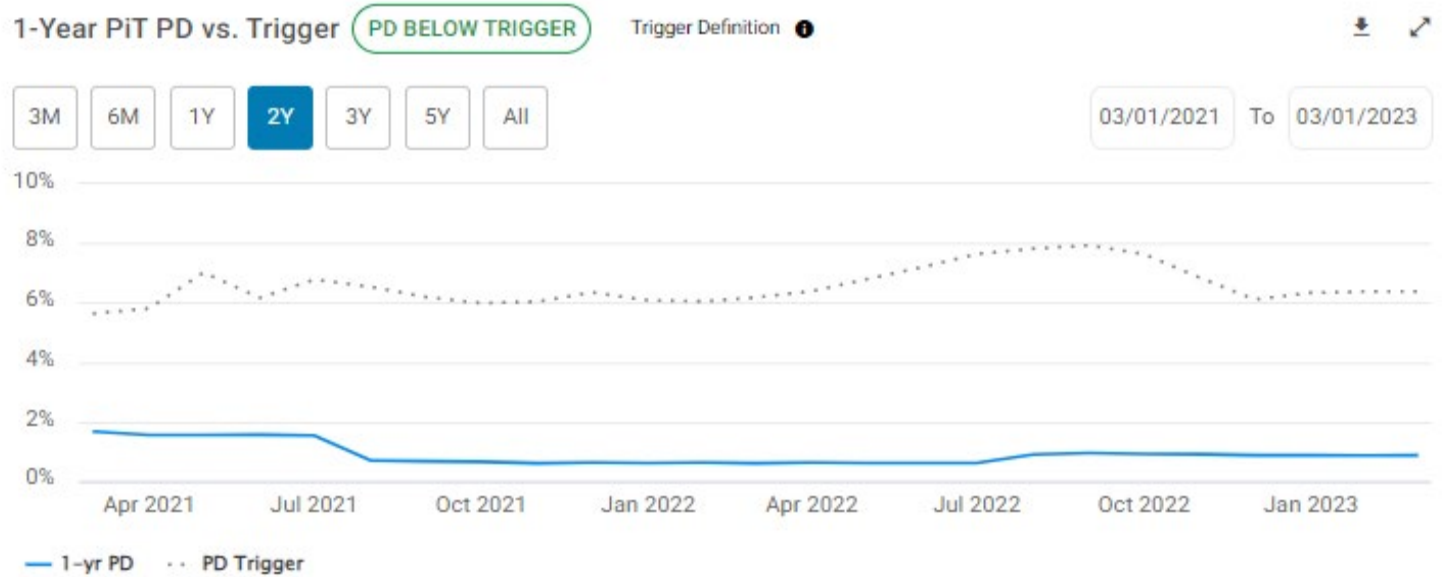
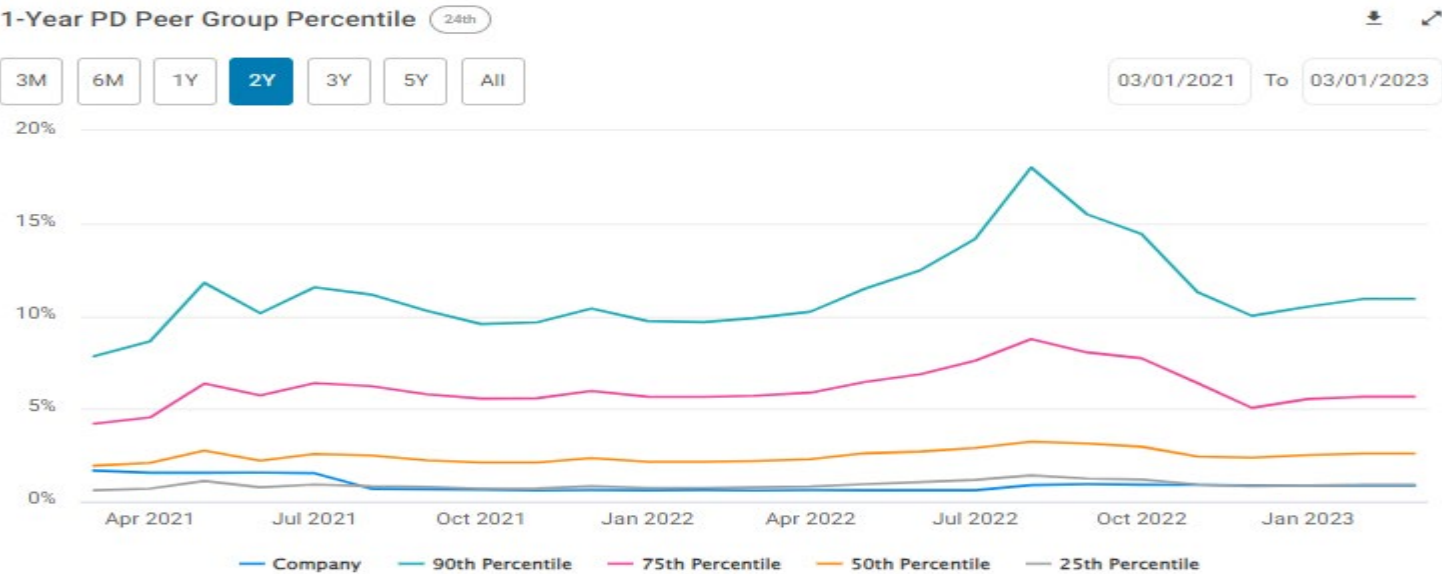
PD model ratios

PD Drivers

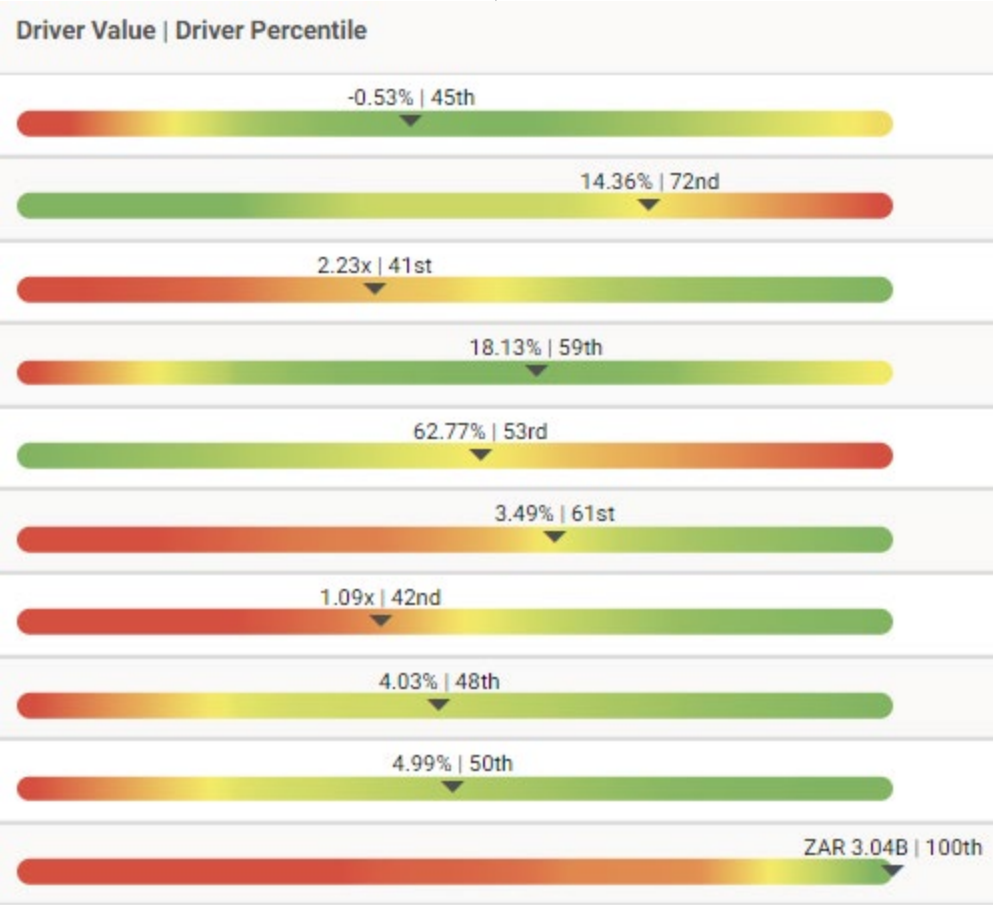


Driver Category Category Weight ⓘ	Drivers
Activity 21.80%	Chg in AR/sales
	Total Inventory/Total Cost of Goods Sold
Debt Coverage 7.90%	(EBITDA+Chg of Account Payable - Chg of Inventory -Chg of Receivables)/ (Interest Expense and other Financial Expenses)
Growth 8.90%	Sales Growth
Leverage 14.40%	(Total Current Liability+Total Long Term Debt)/(Assets - Int. Assets)
Liquidity 26.40%	(Cash&Maketable Securities) / Total Assets
	Cur Asset/Cur Liab
Profitability 16.70%	Lag (NI)/Lag (Assets)
	(NI) / Assets
Size 4.00%	Real Assets

And benchmark against relevant peers



Financial ratio percentile



Obligor PD vs sector PD

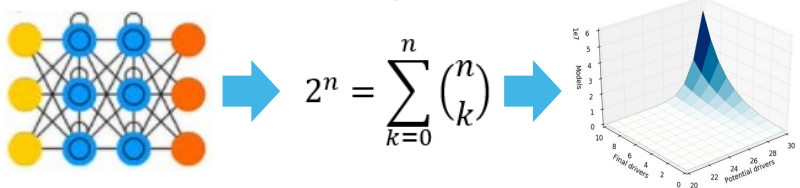
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Using Additional Data

Unsupervised learning: dimensionality reduction for macro data

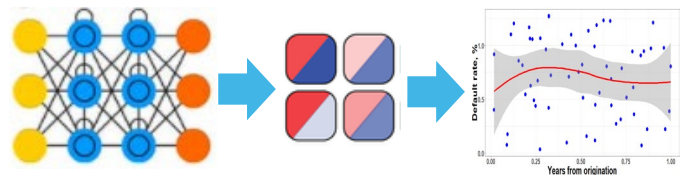
Problem statement

Multiple factors lead to millions of models combinations and long computation hours



ML-enabled solution

Reduce dimensionality of input factors by extracting only useful information

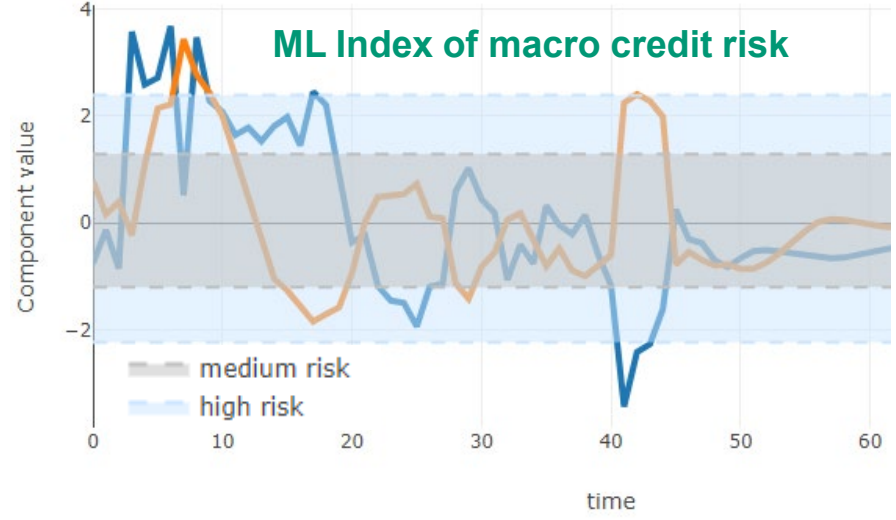
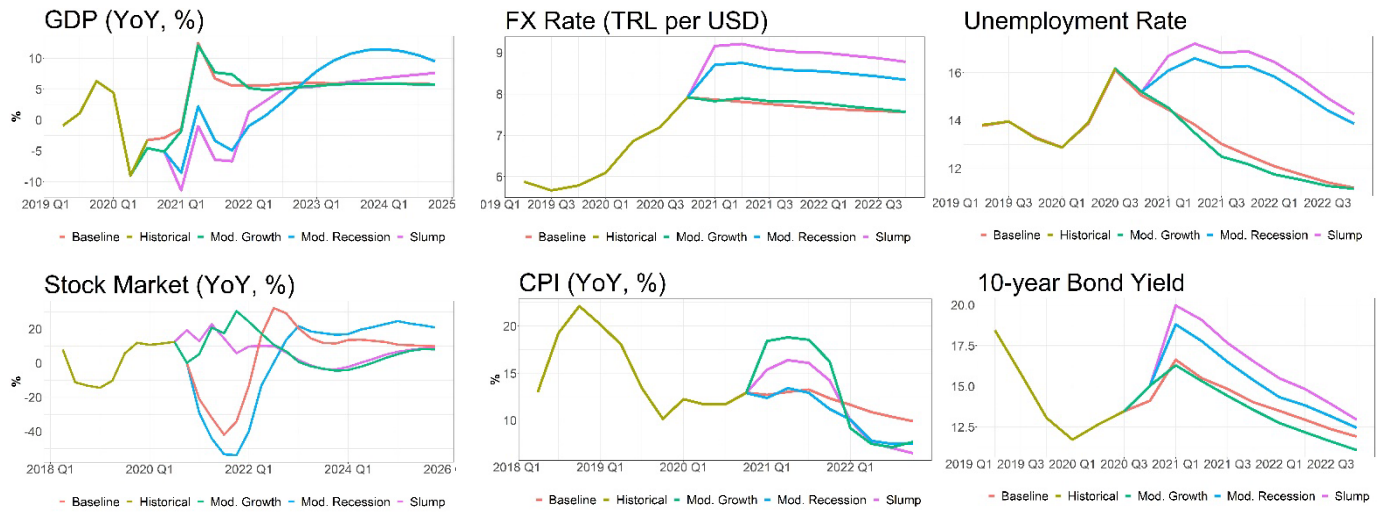


Example

For four macro factors, their transformations and two lags, the number of potential models exceeds **16 mln** ($\sim 2^{24}$).

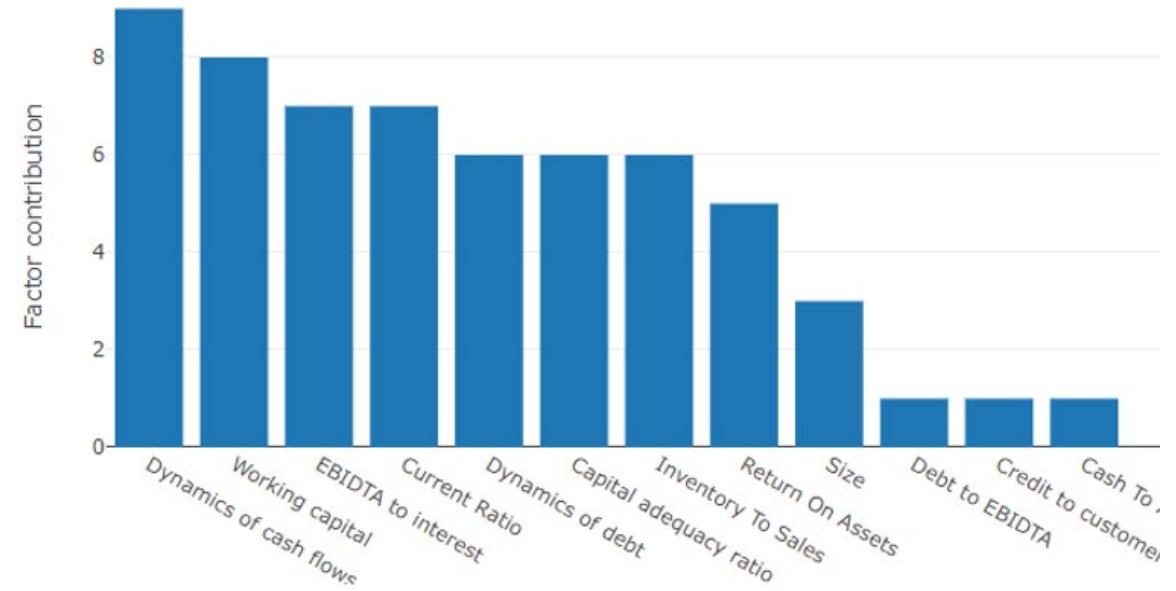
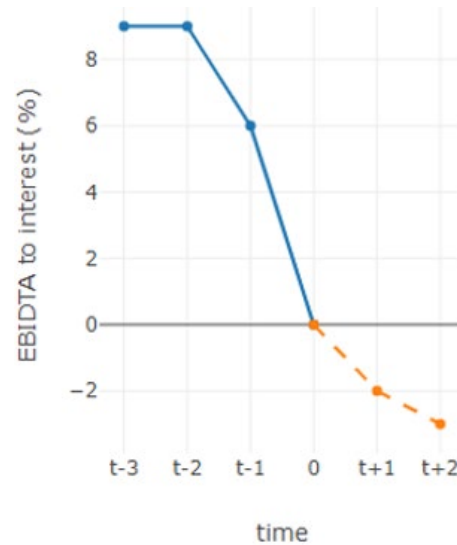
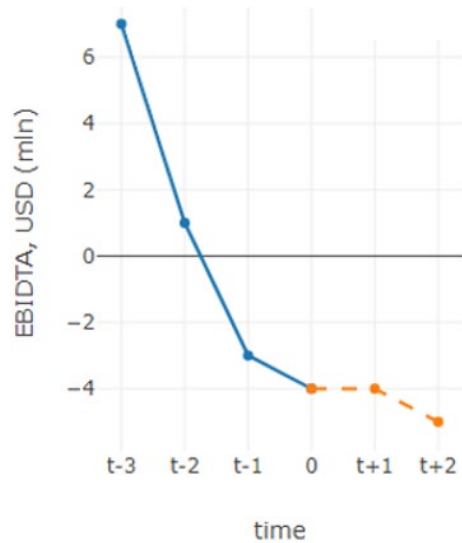
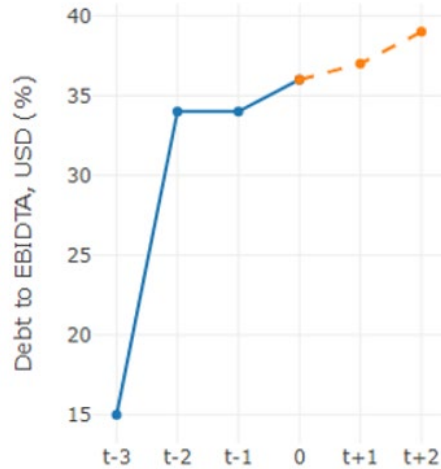
ML techniques allow us to include all the variables without having to estimate all those 16mln models.

Macro factors, their transformations and lags



Forecasting macro-conditional financial performance

Examples of ratios and their projections

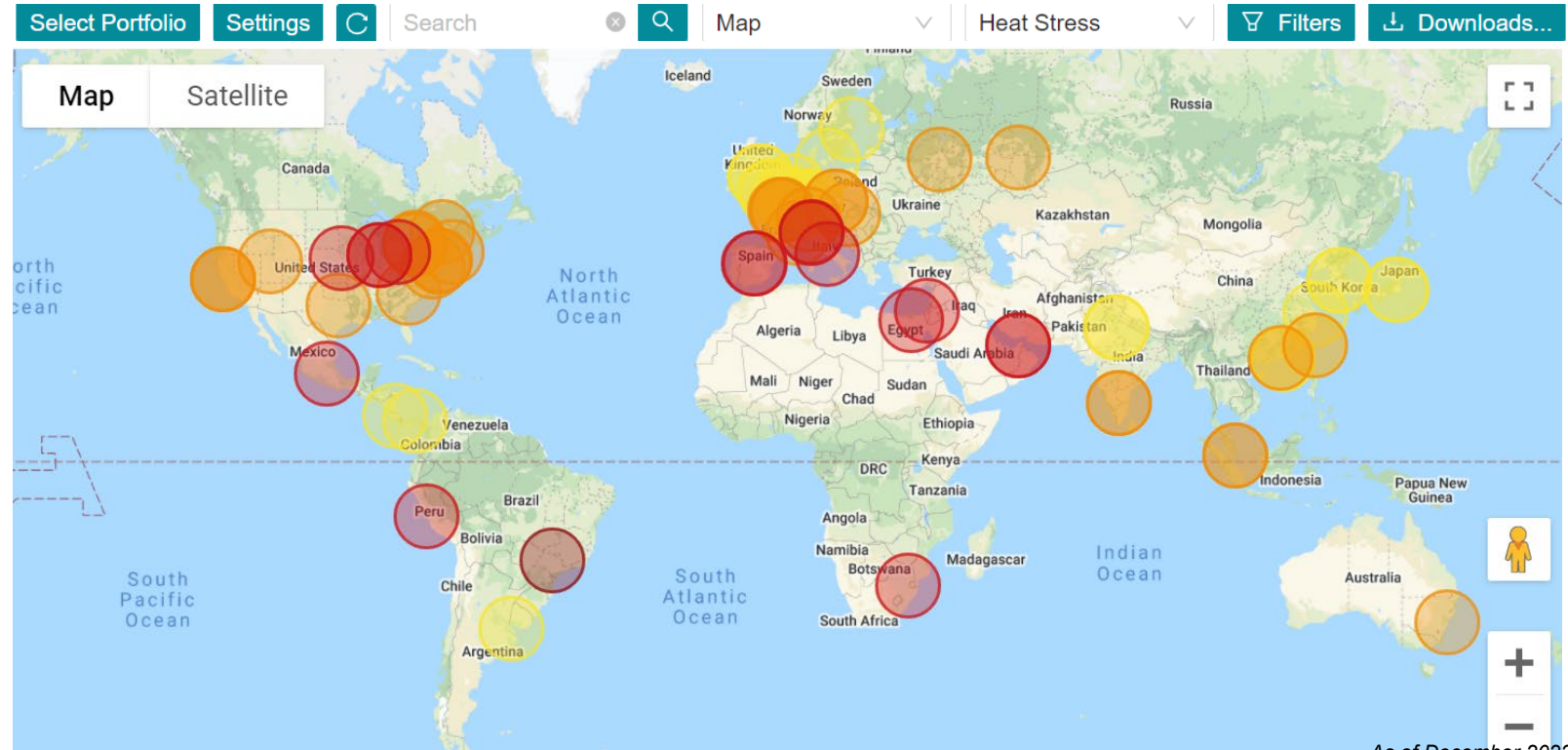


Contribution analysis

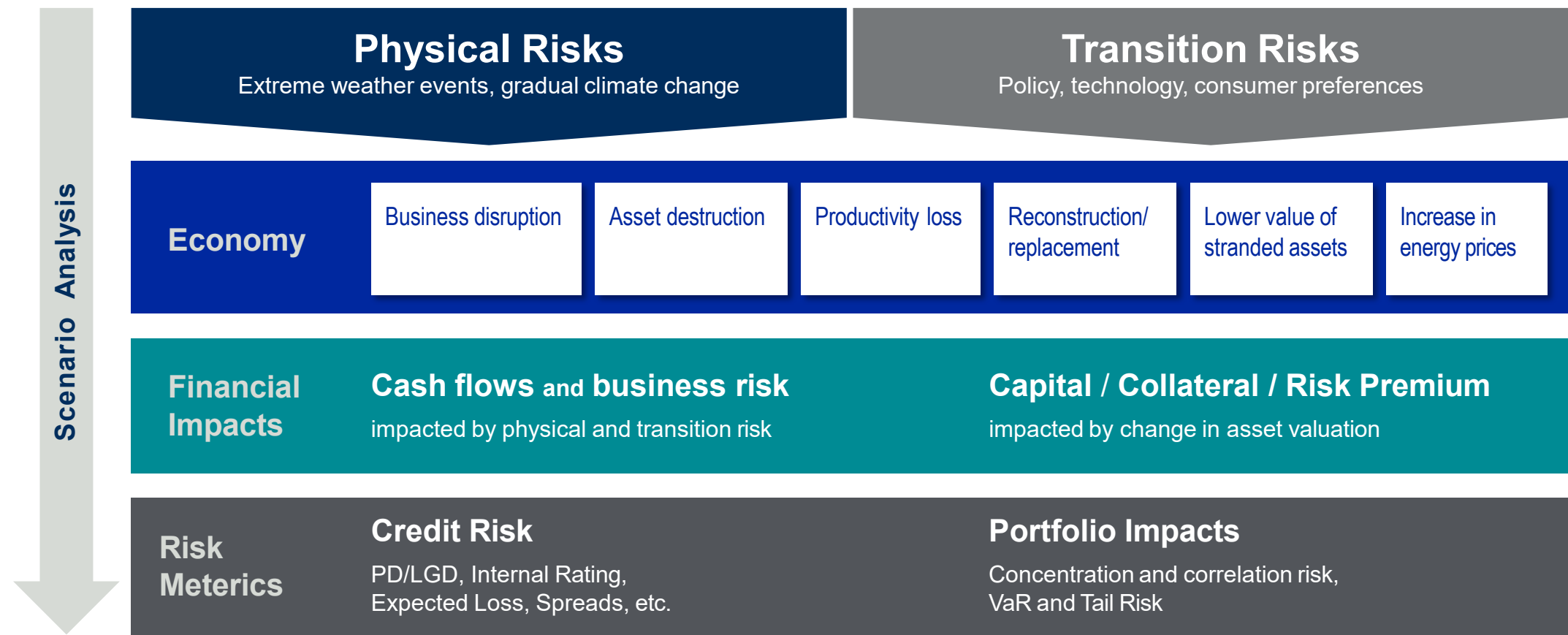
Climate (physical & transition) risks

View locations on a global map to understand risk level by hazard type

- » Portfolio and single asset exposure to climate risks – wildfires, heat stress, flooding, etc.
- » Scores and risk management assessment for unlisted companies and submarkets, markets, and regions
- » Catastrophe models for a wide range of perils
- » Climate-adjusted PDs & portfolio concentration analysis



Impact of physical and transition risks on probability of default



ESG credit risk scorecard outputs

Easy to use and transparent framework

ESG INTEGRATION INTO CREDIT ANALYSIS

ESG CROSS-SECTOR FACTORS

Overall Environment Credit Risk Score



- » Carbon Transition
- » Physical Climate Risks
- » Water Management
- » Waste & Pollution
- » Natural Capital
- » Contribution to Sustainable Development

Overall Social Credit Risk Score



- » Customer Relations
- » Human Capital
- » Demographic & Social Trends
- » Health & Safety
- » Responsible Production

Overall Governance Credit Risk Score



- » Financial Strategy & Risk Management
- » Management Credibility & Track Record
- » Organization Structure
- » Compliance & Reporting
- » Board Structure, Policies & Procedures

ESG CREDIT RISK SCORE*

- 1 Credit Positive
- 2 Credit Neutral-to-low
- 3 Moderately Credit Negative
- 4 Highly Credit Negative
- 5 Very Highly Credit Negative

ESG CREDIT RISK RATING NOTCHING ADJUSTMENT

The ESG Credit Risk score translates to an appropriate notching adjustment to the baseline credit rating of an entity.

*The ESG Credit Risk Score is an output of the scorecard that transparently communicates the impact of ESG considerations on the credit rating of an entity. An industry adjustment is applied to certain NACE level 4 industry groups which are classified as more favourably and unfavourably impacted by ESG credit risk considerations in general. These industries include: i) Oil & Gas, ii) Pharmaceuticals, iii) Paper and Forest Products, iv) Media and Entertainment, v) Regulated Electric and Gas Utilities, vi) Financial Institutions. The assignment of the final ESG Credit Risk Score within the final indicative range is also linked to the Overall ESG Score bucket from ESG Score Predictor.

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