CLIMATE ALPHA
ANALYTICS GUIDE

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Climate Alpha

Climate Alpha's Analytics Suite

	Climate Alpha		Market State-of-Play
	Resilience Index™ Scores		
Risk Exposure Analysis	**Climate Physical Risks** (First-order effects)	Heat	Most providers offer only climate physical risk scores along these same categories.
		Storm	
		Drought	
		Fire	
		Flood	
	Vulnerability Index (Second and third-order effects)	Population density	In contrast to the current market emphasis on risk alone, our proprietary Resilience Index™ also captures vulnerability and readiness indicators that exacerbate or moderate climate impact across locations.
		Coastal population	
		Age structure	
		Urban porosity	
		Infrastructure	
		Poverty and inequality	
	Readiness Index (Second and third-order effects)	Credit score	
		Healthcare	
		Crime and safety	
		Education	
		Public spending	
		Clean energy	
Impact Metrics	**Average Annual Loss**	Average annual valuation loss in dollar value or percentage from the current year to target year	Same
	Climate Price Valuation Metric	Risk-adjusted valuation under multiple climate change scenarios and attribution analysis	Most vendors provide loss/risk impact metrics like VaR, but not valuation metrics or forecasts.

(1) Risk Exposure Analysis via Resilience Index™ Scores

Indicator	Sub-indicator	Underlying data
Climate Physical Risk (First-order effects) Climate Risk = Hazard Exposure x Hazard Likelihood x Deviation from Historical Thresholds Each location has unique thresholds calculated from historical data. Details are explained in our technical white paper.	Heat Risk	Likelihood of heat event Mean annual temperature Diurnal temperature range
	Storm Risk	Likelihood of storm event Storm intensity Wind
	Drought Risk	Likelihood of drought event Freshwater availability Freshwater demand
	Fire Risk	Historical fire events Vegetation cover percentage Wind speed and humidity
	Flood Risk	FEMA flood score Surface runoff volume
Vulnerability Index (Second and third-order effects) Measures how exposed a location is to physical risks induced by climate change.	Population density	Population per acre
	Coastal population	% of the population near coast
	Age structure	% population above 65 years old
	Urban porosity	% built-up area % road cover
	Infrastructure	% buildings built before 2000 % bridges and roads in poor condition
	Poverty and inequality	% population in poverty % income spent on rent
Readiness Index (Second and third-order effects) Measures how prepared a place is to physical risks induced by climate change	Credit score	Median FICO score Debt to income ratio
	Healthcare	Hospital bed per 1,000 population % population with health insurance
	Crime and safety	Violent crimes per 100,000 residents
	Education	% population with high school education and above
	Public spending	Per capita infrastructure spending Per capita spending on parks and civic institutions
	Clean energy	Energy from renewable sources Per capita clean energy investment

(2) Understand the Financial Impact of Climate Risk

Climate Alpha goes beyond risk scoring to help investors with metrics measuring the *material impact* of climate risk on investor portfolios.

Climate Price™ Valuation Suite	
Valuation Forecasts	• Climate-adjusted property price forecasts at asset and portfolio level, with multiple analytical outputs including charts for climate-adjusted CAGR, property price index, and asset value • Segmentation by asset, property type, or portfolio
Loss Metrics	• Average annual loss in dollar value or percentage from the current year to the target year • Value-at-Risk at asset and portfolio-level
Granularity	Zip code level analysis
Explainability	Includes feature correlation analysis generated from machine learning model displaying top 5 and bottom 5 indicators corresponding to location performance
Actionability	Climate Price™ disposition analysis recommending a year of asset disposition based on price divergence between baseline trend and climate scenario
Interoperable	The Climate Price™ coefficient applies to baseline (non-climate scenario) forecasts and can inform internal valuation and financial models

Climate Alpha's Scores and Metrics

	Climate Alpha	We complement existing vendors who provide...
Scenarios	- SSP1 RCP3.4 (*Optimistic*) - SSP3 RCP4.5 (*Business-as-Usual)*) - SSP5 RCP8.5 (*Pessimistic*)	- NGFS Scenarios - Below 1.5 or 2 degree scenarios
Scenario Customization	Users can toggle climate and non-climate variables to modify and save custom scenarios for comparison	Few provide this capability.
Granularity	- Asset - Portfolio - Country - Location (zip code, county)	- Asset - Sector - Portfolio - Country
Time Horizon	We provide *annual* forecasts from present year to 2040.	A range, from near-term (2040) to long-term (2100)
Asset Types	Real assets and derivative instruments (e.g. MBS)	- Public Equity - Fixed Income - Corporates
Property Types	Bespoke models for: - Residential - Commercial - Industrial - Agricultural - Land	Standardized models that do not consider property type distinctions
Data Integration	We offer a data blending service where we train our machine learning models with client data for more customized results. Data confidentiality is maintained and shared only with client.	Relevant raw data sets useful in valuation modeling.
Use Cases	- Risk management - Regulatory reporting - Due diligence - Valuation - Investment strategy	- Risk management - Regulatory reporting

TCFD-Ready Risk Analytics

TCFD Recommended Disclosures		
Theme	**Recommended Disclosures**	**Climate Alpha Capabilities**
Strategy	*Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.*	Our Resilience Index™ scores help companies: (1) **Standardize physical climate risk** scores for: heat, storm, fire, drought, flood (2) **Differentiate with additional vulnerability and readiness scores** to stand out from competitors Data provided annually from present year to 2040 **enabling short, medium, and long-term analysis**
	Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning.	Our Climate Price™ risk-adjusted valuation suite allows investors to **quantify impact of climate-related risk and opportunities in financial terms.** The feature weight attribution explains the relative influence of each climate factor on the Climate Price™ enabling stronger defensibility as well as the development of internal assumptions for business and strategy planning.
	Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	3 industry-standard RCP-SSP Scenarios ● SSP1 RCP3.4 ● SSP3 RCP4.5 ● SSP5 RCP8.5 Customized scenarios using our Scenario Forecaster™ platform.
Metrics and targets	*Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.*	Our climate risk and impact metrics are quantifiable and explainable: ● **Resilience Index™:** scores are decomposed into its 18 sub-indicators of climate physical risk, readiness, and vulnerability ● **Climate Price™:** Includes feature correlation analysis and attribution analysis to decompose factors impacting climate-adjusted valuation
	Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.	Create hypothetical benchmarks or portfolios for reweighting portfolios towards climate resilience locations.

Risk Analytics for the FRB's Climate Scenario Analysis

We are rapidly developing capabilities to help financial institutions participating in the Federal Reserve Board's **Climate Scenario Analysis physical risk module**.

Iteration	Severity					
	Climate Pathway		Return Period Loss		Year of Shock	
1. Common Shock Stress Test						
	FRB Requirement	**CA**	**FRB Requirement**	**CA**	**FRB Requirement**	**CA**
1	SSP2-4.5/RCP 4.5	Y (SSP3 RCP4.5)	100-year	In development	2050	Y
2	SSP5-8.5/RCP 8.5	Y (SSP5 RCP8.5)	200-year		2050	Y
3			200-year		2050	Y
2. Idiosyncratic Shock Stress Test						
4	SSP2-4.5/RCP 4.5	Y (SSP3 RCP4.5)	100-year	In development	2050	Y
5	SSP5-8.5/RCP 8.5	Y (SSP5 RCP8.5)	200-year		2050	Y
6			200-year		2050	Y

Impact				Property Type	
Hazard		Geography		Loan Portfolio	
1. Common Shock Stress Test					
FRB Requirement	**CA**	**FRB Requirement**	**CA**	**FRB Requirement**	**CA**
Severe hurricane(s)	In development	Northeast NCA region	Y Full US coverage	Residential, Commercial Real Estate	Residential, commercial, industrial, and agricultural land and properties
2. Idiosyncratic Shock					
Participant chosen Participant chosen Participant chosen	Heat, Storm, Drought, Fire, Flood	Participant chosen NCA region	Y *Full US coverage*	Residential, Commercial Real Estate	Residential, commercial, industrial, and agricultural land and properties

Why Choose Climate Alpha?

	Market Gap	Climate Alpha Solution
Value-at-Risk and Risk-Adjusted Valuation	Market is focused on loss metrics like climate VaR	Both value-at-risk metrics as well as proprietary Climate Price™ valuation forecasts
Risk and Opportunity	Vendors provide risk scores or loss metrics that give no indication of where climate resilient upside may lie.	Climate Price™ valuation forecasts allow investors to identify both climate winners and losers by identifying assets that (a) outperform; and (b) underperform historical baseline projections
First vs. Second and Third Order Effects	Climate risk providers focus on first-order climate physical risk scores. This ignores the second-order interplay between physical risk and the broader market environment.	Climate Price™ valuations draw on Resilience Index™ scores that combine physical climate risk factors with the adaptive capacity of a location. Our models account for how climate influences other macroeconomic parameters using latest research on the correlations between climate hazards (e.g. heat) with insurance, regulation, migration, and other macroeconomic conditions.
Deep vs. Wide Data	Existing vendors are steeped deep in climate physical risk datasets	We complement deep data methods with our expertise in *wide data* – combining >1,500 climate with non-climate datasets to model first, second, and third order effects.
Micro vs. Macro	Asset-level analysis alone neglects macro-level factors (e.g. fiscal capacity to withstand hazards).	We provide both asset and location-level analysis.
Absolute vs. distributed metrics	Many providers offer metrics based on static, absolute dollar values that do not capture range of probabilities that come with uncertainty of climate change	Climate Price™ is generated based on a distribution of expected outcomes, as opposed to an absolute dollar value.
Transparent and Explainable Results	Black box machine-learning models	• Attribution analysis • Feature correlation analysis explains effects of variables on model results • Accessible technical documentation
Data integration	Lack of integration between vendor and client data	Data blending solutions
Speed	Large providers would have slower processes and difficulty handling bespoke requests at speed or scale.	Speedy implementation timelines, no implementation costs, and openness to bespoke requests (e.g. custom data lake, new country forecasting model, new impact metrics)