



# Energy risk and credit portfolio impact analysis

*A potential approach for application and main takeaways*

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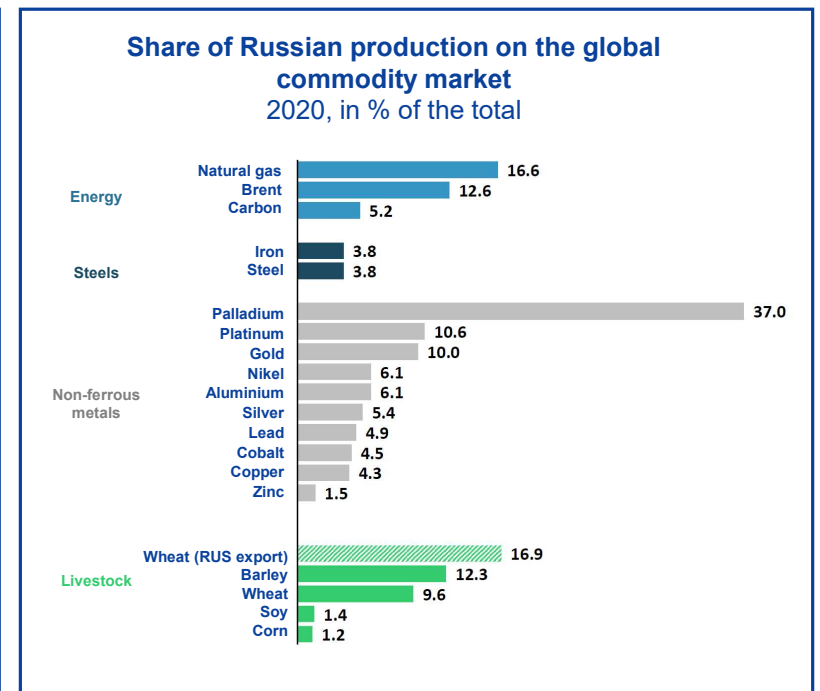
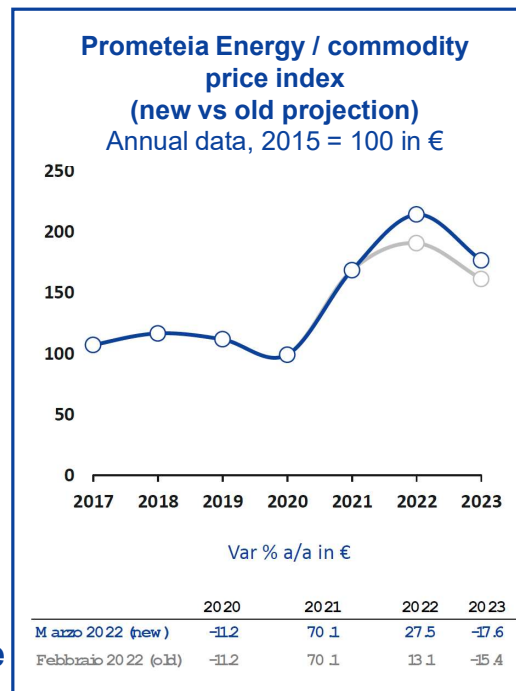


# Background

The Russian invasion of Ukraine February 24th has increased energy and commodity price levels and volatilities extended to almost all sectors

**The most penalized companies, once again, are the ones belonging to the most energy-intensive sectors**, given the role of Russia as primary exporter of oil and natural gas

Furthermore, **regardless of the evolution of the conflict, the energy dependence of countries and companies will continue to generate strong price volatility**



# Background

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Banks are facing new challenges for **supporting Energy Risk Management** through a **combination of products and services** (mainly data and analytics) that are going to be integrated into strategic planning & risk management framework.

The processes that we typically impacted are:

- **Generation of energy and commodities prices scenarios**, spreading the impact of macro-economic, financial as well as geo-political risk factors on energy and commodities prices
- **Quantification of Energy Risks** for a set of relevant risk factors (commodities & raw materials)
- **Quantification of Energy Risk** with focus on Financials, Corporates and SMEs portfolios
- **Customized development and/or feeding of Credit Risk analytics to assess the impact of Energy Risk factors** on Credit Risk parameters (PDs and LGDs), for example via scorecards and satellite models

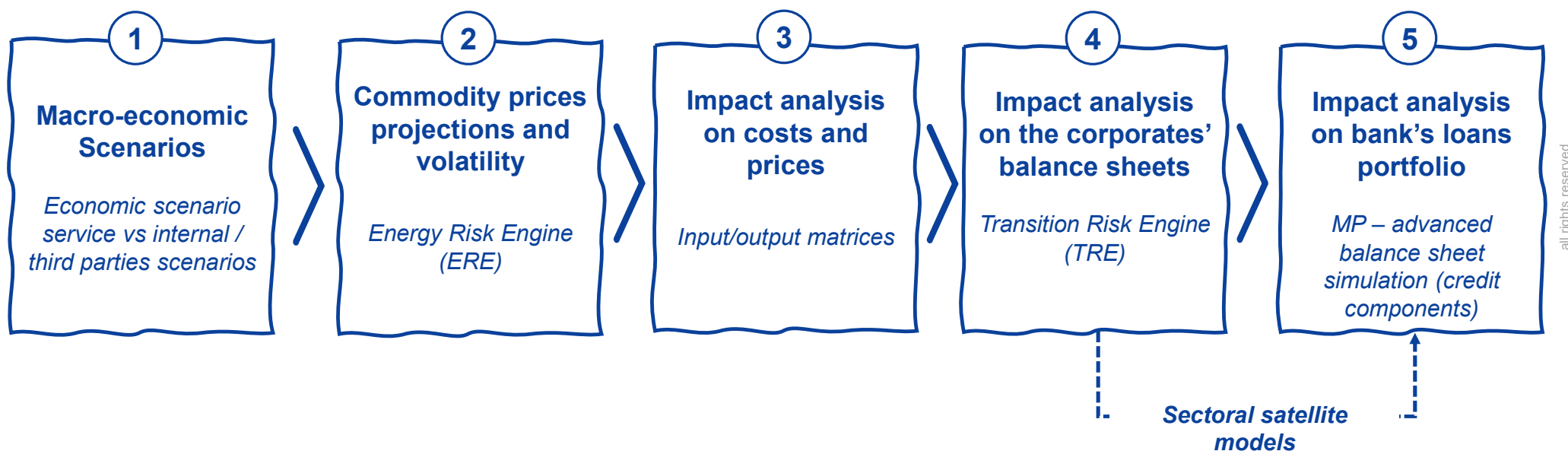
As a next step, Prometeia is **leveraging its proprietary technological environment** (the Prometeia Modelling Platform™) in order to support a wider spectrum of analytical processes impacted by Energy Risk, among which:

- **Credit Portfolio impact analysis**, to assess the impact of Energy consumption exposure on operational costs and, and the consequent credit and financial portfolios, for multiple purposes, including ICAAP, Active Credit Portfolio Management, Budgeting and Product Control



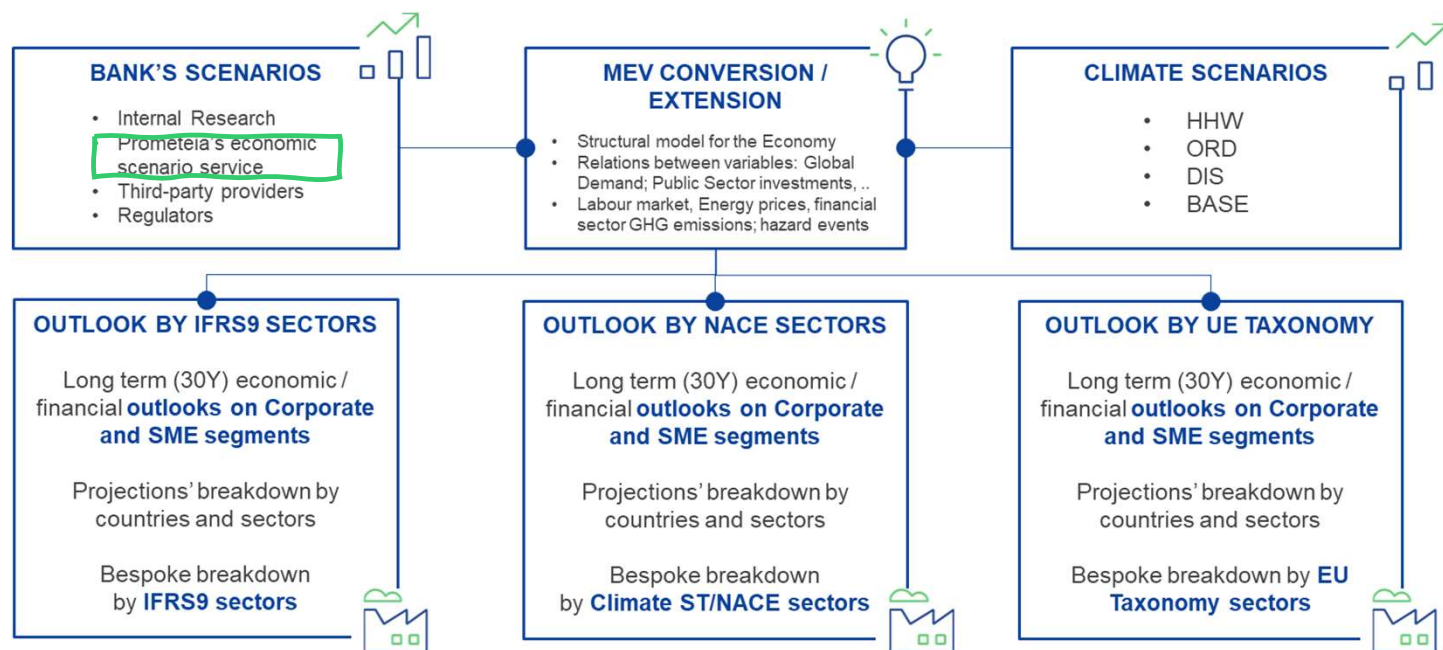
# Our framework

Holistic view



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# 1 Macro-economic Scenarios



**Macro-economic Scenarios** allow to include both **energy** and **climate-related risk** into the actual **Stress Test framework** or **bank strategies**



## Input data

- **Bank's scenarios:** future patterns of macro-economic variables, provided by the Internal Research, Third-party providers (Prometeia in case), the Regulator
- **ECB / NGFS Scenarios:** Hot House World scenario, Orderly and Disorderly scenario, Base.

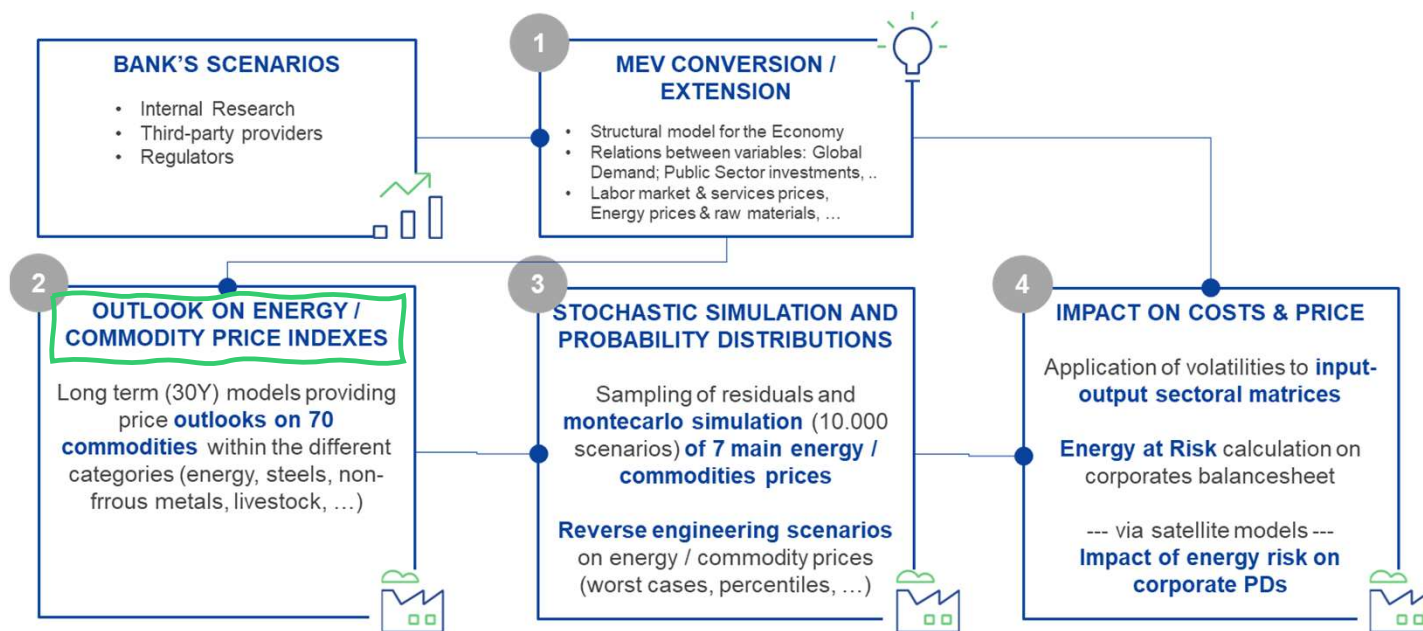
## Calculation methodology

- The macroeconomic variables determine the patterns of the final **aggregate demands for each sector**
- Objective is to **downscaling NGFS scenarios to sectoral level**, simulating the impact of energy and climate related variables within the model's dynamics

## Reporting

- **Outlook projections** by IFRS9 sector, NACE sector, EU and NSF sector

## 2 Commodity prices projections and volatilities



**Energy / Commodities price indexes models\* can be fed with external / banks scenarios to provide outlooks on more than 70 prices indexes**



(\*) Models are integrated into Prometeia Modeling Platform and can be run through a stochastic scenario generator to generate volatility around the best estimate and, finally, analyze impacts of energy risks on the cost / income structure of corporates and financials



### Input data

- **Bank's scenarios:** future patterns of macro-economic variables, provided by the Internal Research, Third-party providers (Prometeia in case), the Regulator
- **Balance sheets**
- **Default rates.**

### Calculation methodology

- The macroeconomic variables determine the patterns of the best estimate **projection of energy / prices commodity**
- **Montecarlo simulation engine generates uncertainty** around the best estimate and prices' probability distributions

### Reporting

- **Outlook and probability distributions** of energy commodity price indexes
- **Outlook and probability distributions** of sectoral operational costs and default rates

## 2 Energy Risk Engine – ERE

commodities and raw materials perimeter

Outlook on a wide set of energy / commodity price indexes are provided and re-freshed on a quarterly basis considering the evolution of the geo-political and macro-economic environment. Projections can be adjusted in case external scenarios are available / required



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### OUTLOOK ON ENERGY / COMMODITY PRICE INDEXES

Price **outlooks on 70 commodities** within the different categories (energy, steels, non-ferrous metals, livestock, ...)



### Commodities and raw materials perimeter

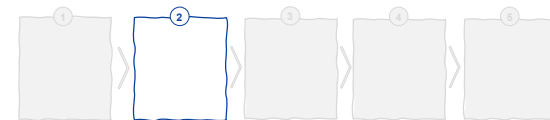
Energia	Siderurgia	Petrochimica	Metalli non ferrosi	Forestali	Tessile agricoli
Brent	Minerali di ferro	Virgin nafta	Alluminio	Cellulosa NBSK	contone
Benzina	Rottami di ferro	Organici di base	Rame	Cellulosa BEKP	lana
Gasolio	Baltic dry index	Aromatici	Zinco	Legname di conifere	pelli
Olio combustibile	Acciai lunghi (indice)	Etilene	Nickel	Legname di conifere (italia)	fiore sintetiche
Energia elettrica (tariffa)	Acciai piani (indice)	Propilene	Piombo	Legname per pallet	poliestere 1.5 D Tex
Energia elettrica (PUN)	HRC	Polietilene (HDPE)	Stagno	Legname per packaging	Nylon 6.6
Gas (contratto take or pay)	CRC	Polietilene (LDPE)	Cobalto	Compensato	Grano
Gas PSV	Rebar	Polipropilene HP	Litio	OSB	Grano (italia)
Gas TTF	Wire Rod	Polipropilene CP	Oro	Pallet	Cereali (Indice)
Dir. Emissione	Acciaio zincato	PVC	Argento	Legname tropicale	Coloniali
Carbone	Inox 304	PET	Platino	Gomma naturali	Fertilizzanti
		Polistirene (GPPS)			
		Polistirene (HIPS)			
		Gomma sintetica			

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## 2 Energy Risk Engine – ERE

Energy / commodities models for price indexes coverage

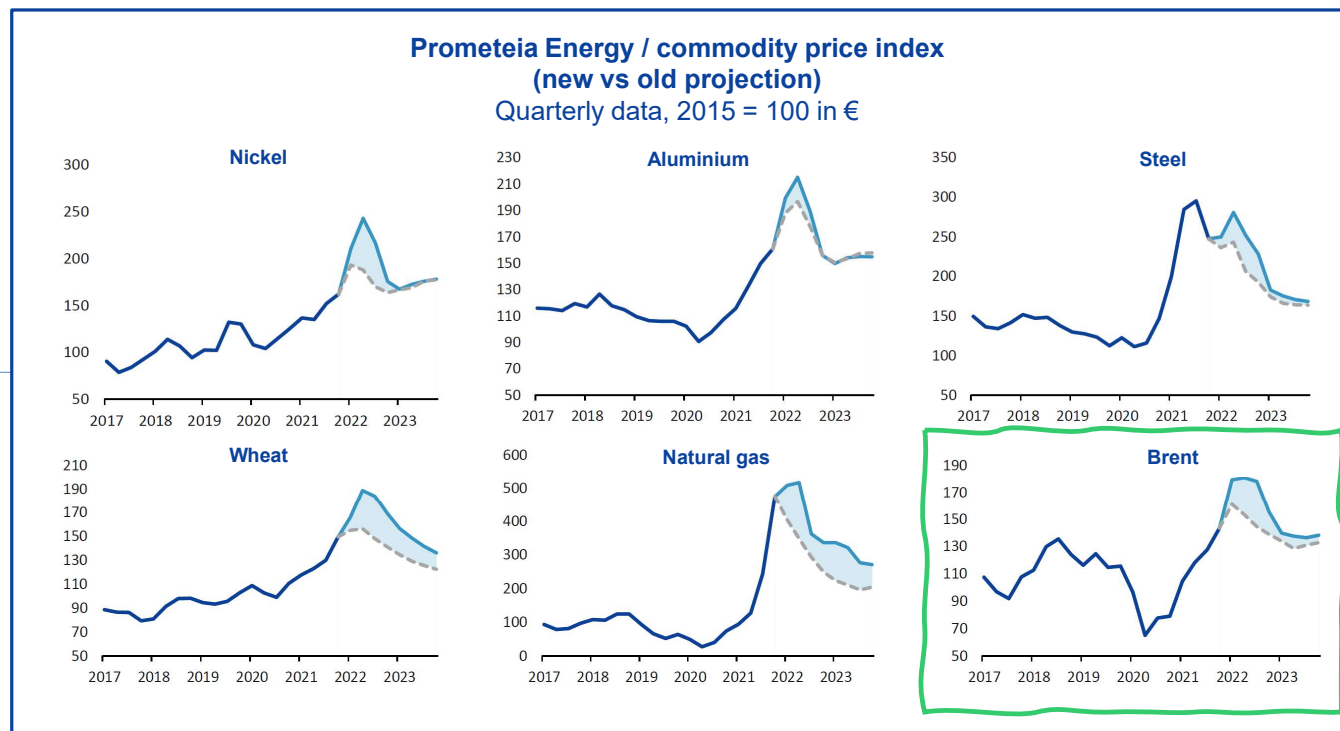
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### OUTLOOK ON ENERGY / COMMODITY PRICE INDEXES

Price **outlooks on 70 commodities** within the different categories (energy, steels, non-ferrous metals, livestock, ...)





## 2 Energy Risk Engine – ERE

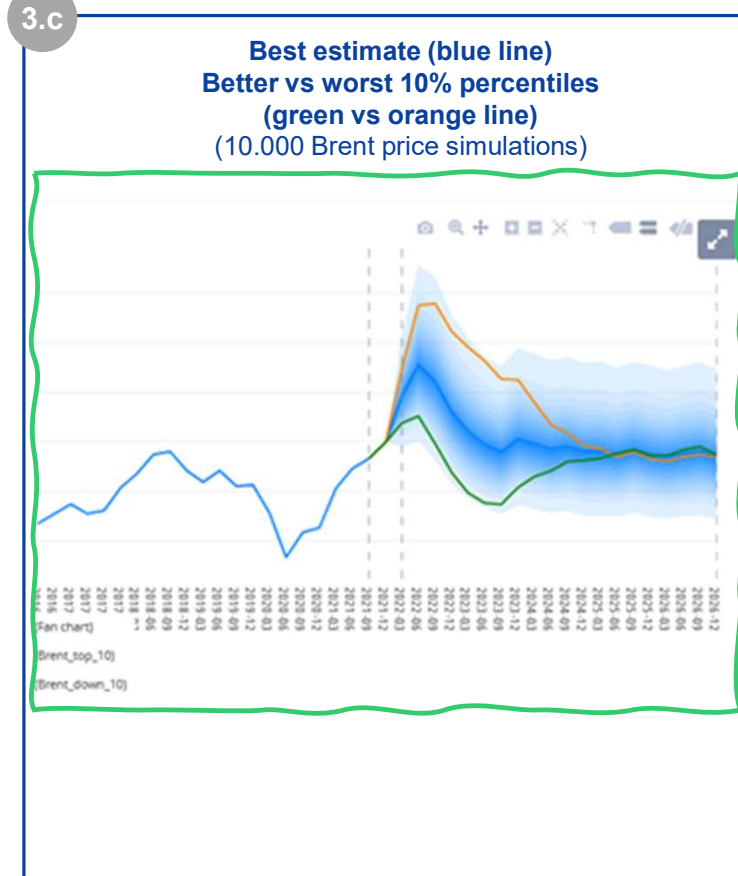
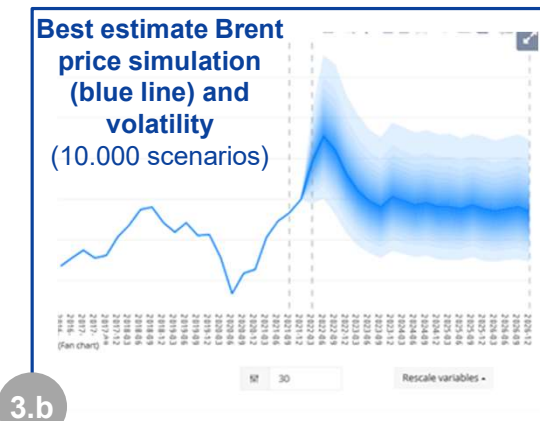
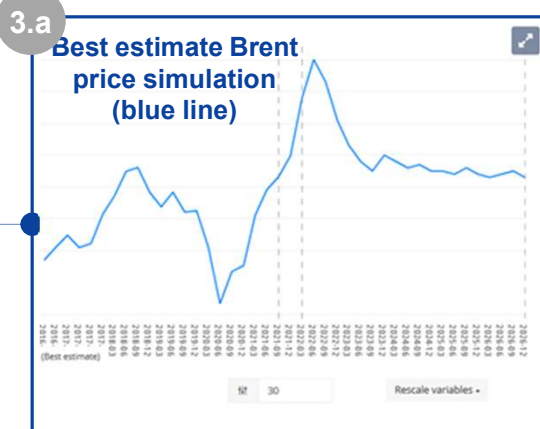
### Stochastic simulation and probability distributions

Running model in a stochastic scenario generator we can add uncertainty to the central tendency of prices, generating distribution probability of possible outcomes

#### 3 STOCHASTIC SIMULATION AND PROBABILITY DISTRIBUTIONS

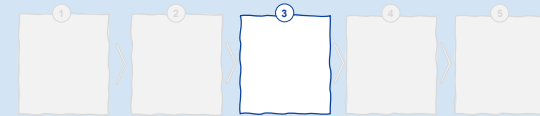
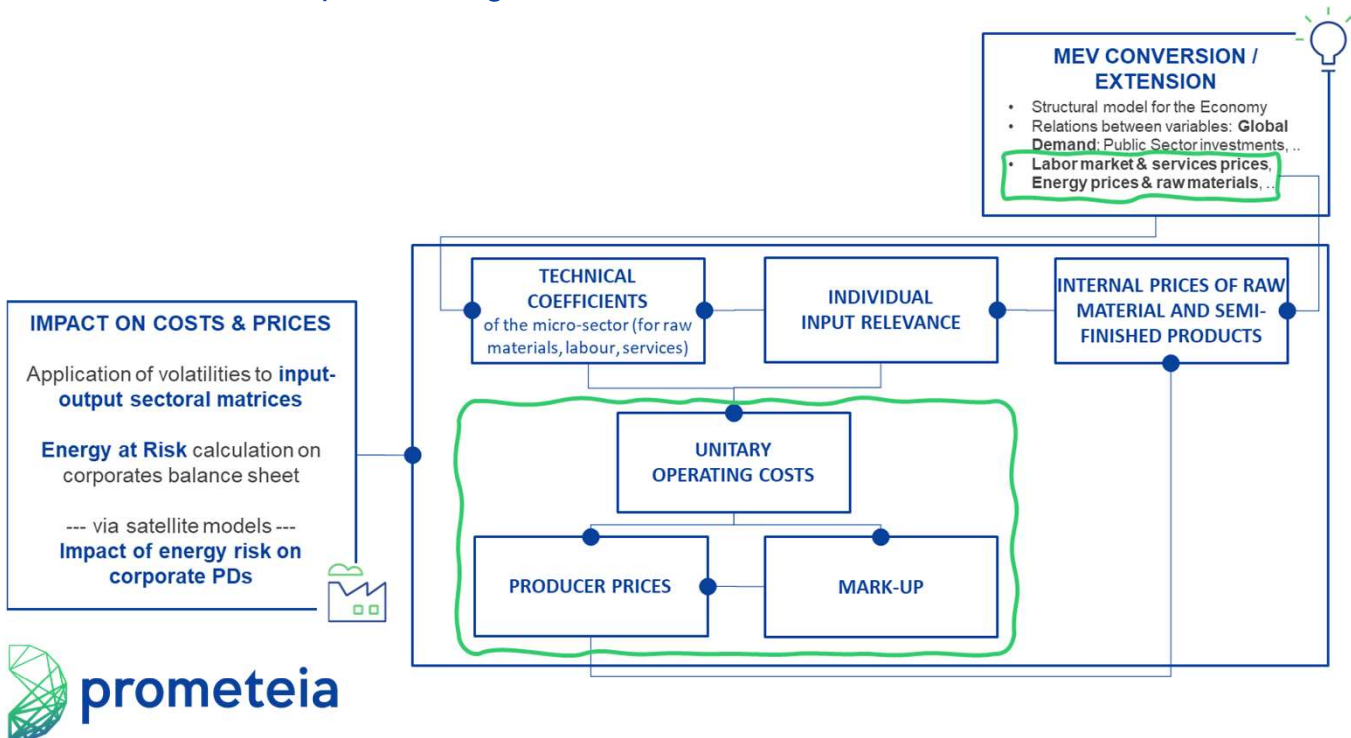
Sampling of residuals and **montecarlo simulation** (10.000 scenarios) of **7 main energy / commodities prices**

**Reverse engineering scenarios** on energy / commodity prices (worst cases, percentiles, ...)



### 3 Impact analysis on costs and prices

Volatility in the energy costs is transferred to cost & price models to evaluate how changes in the prices of production factors (energy & raw materials, semi-finished products, labor and services) could affect sectoral operating costs & prices through an estimation of the “pass through” effect.



#### Input data

- **Macro-economic scenario:** output of the MEV conversion and extension model (provided by Prometeia)
- **Geo-sectoral outlooks:** output of the Sectorial Model for the country-economy (provided by Prometeia)
- **Single name data:** balance-sheets (provided by Prometeia), climate-environment information and other data via qualitative questionnaire (not mandatory)

#### Calculation methodology

- Projection of **costs related to input/ output matrices mapping inputs relevance (by sector) for productions**

#### Reporting

- **Operationnel costs and product prices**

### 3 Input / Output matrices and unitary operating cost

#### Volatilities of unitary operating costs

Volatility of the operating costs due to energy risk is applied through the application of multiple vectors of input averages prices derived by the simulations

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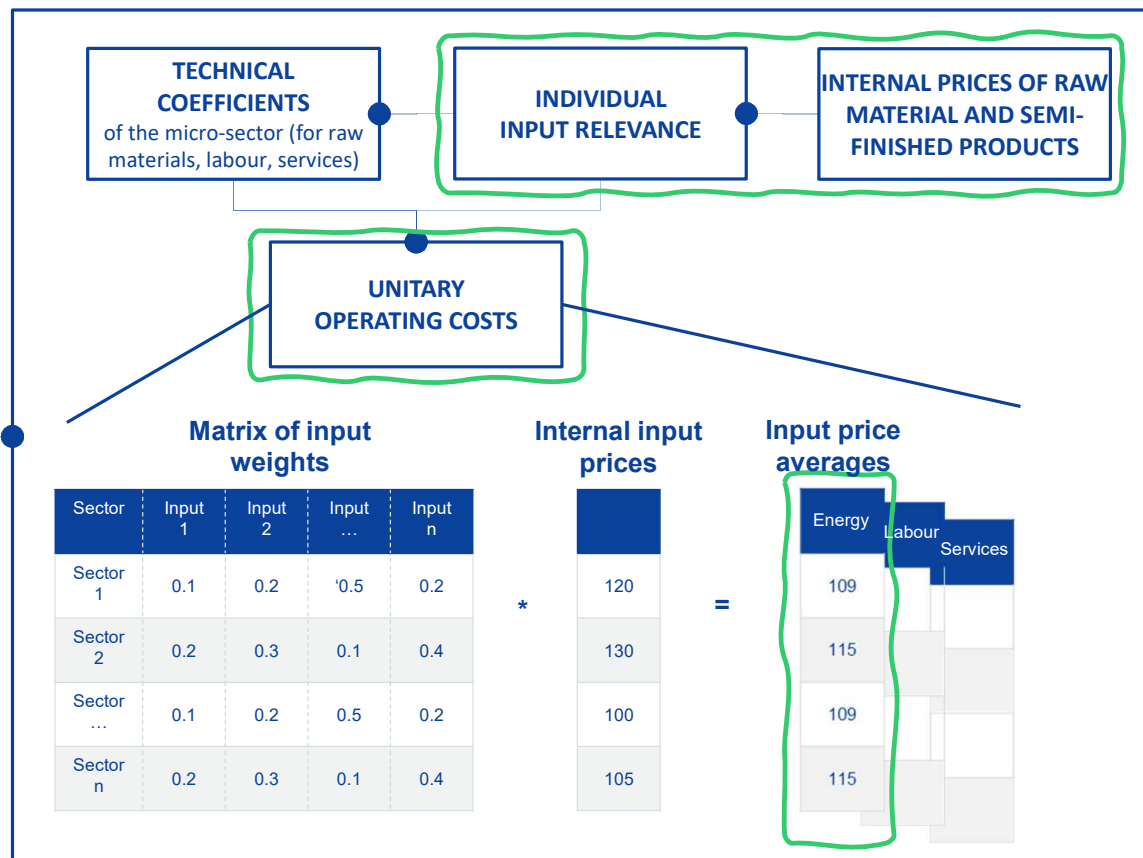
#### IMPACT ON COSTS & PRICES

Application of volatilities to **input-output sectoral matrices**

**Energy at Risk** calculation on corporates balance sheet

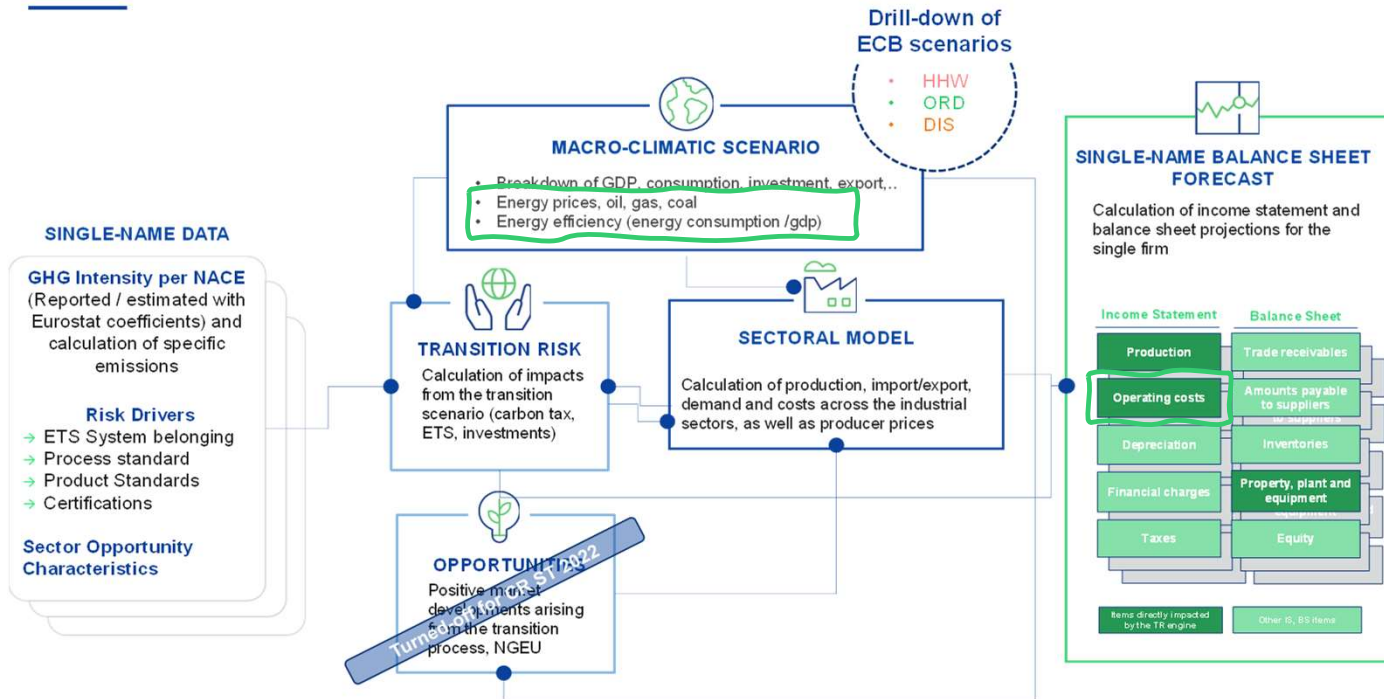
--- via satellite models ---

**Impact of energy risk on corporate PDs**



## 4 Transition Risk Engine

Simulating risk factors impacts on corporate balance sheets



The **Transition Risk Engine** enables **bottom-up simulations** with few data provided by the Bank, **accuracy increases once Client engagement does**



### Input data

- **Macro-climate scenario**: output of the MEV conversion and extension model (provided by Prometeia)
- **Geo-sectoral outlooks**: output of the Sectorial Model for the country-economy (provided by Prometeia)
- **Single name data**: balance-sheets (provided by Prometeia), climate-environment information and other data via qualitative questionnaire (not mandatory)

### Calculation methodology

- Projection of **costs related to ETS, investment in energy efficiency and Carbon Tax**

### Reporting

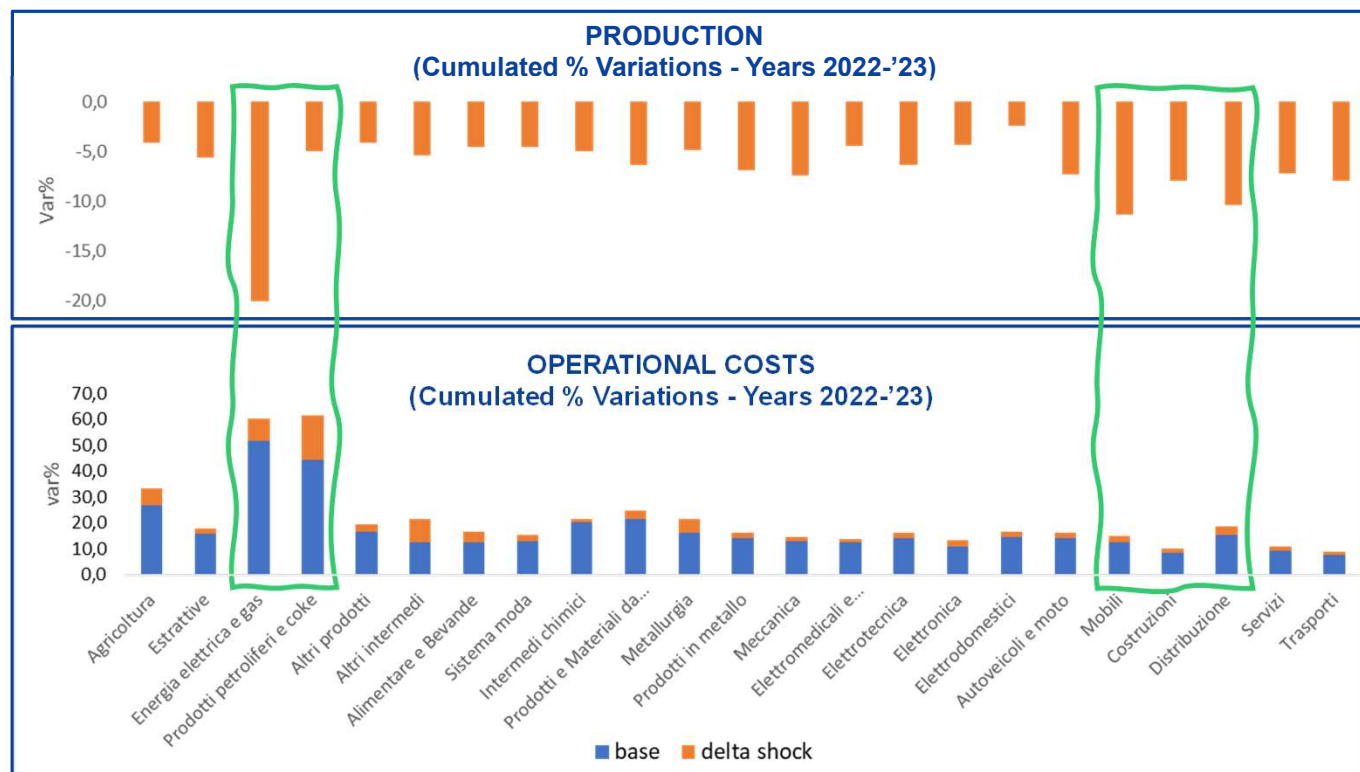
- **Companies' Balance sheet / income statement variables at cluster and / or single name level**
- Output can be aggregated dynamically by multiple dimensions

# Transition Risk Engine

Impacts on production and operational costs

**Under the inflationary stress scenario, both costs and production effects will impact negatively corporates balance sheets**

- The effects of significant interruptions in gas supplies will impact on the costs of companies especially in 2022
- In 2023 the heavy recessionary effects (lowering demand) will favor the return of commodity prices
- Over the two years as a whole, the effects on production levels will be more severe than those on costs



# Sectoral satellite models

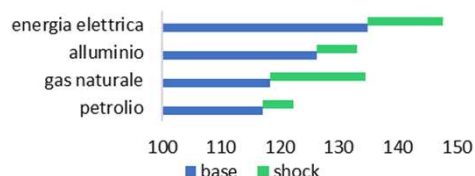
## Impacts on default rates

Under the inflationary stress scenario, a commodity price shock would lead to a 1.3% increase in the default rates in 2023

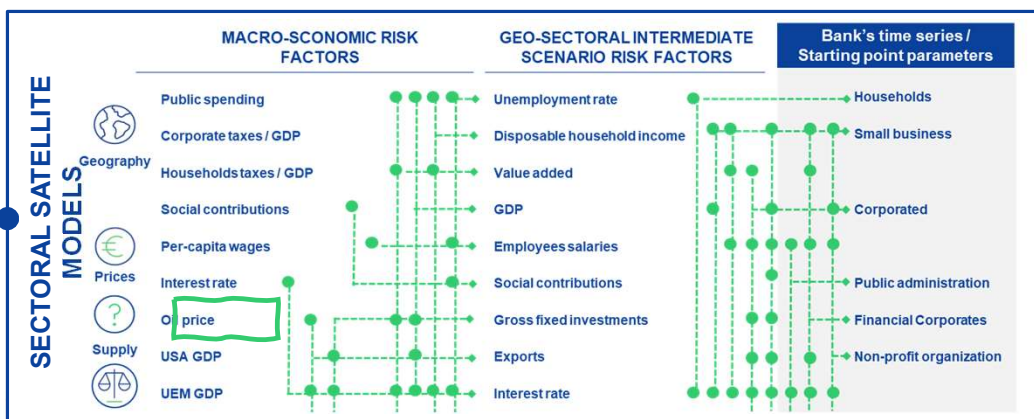
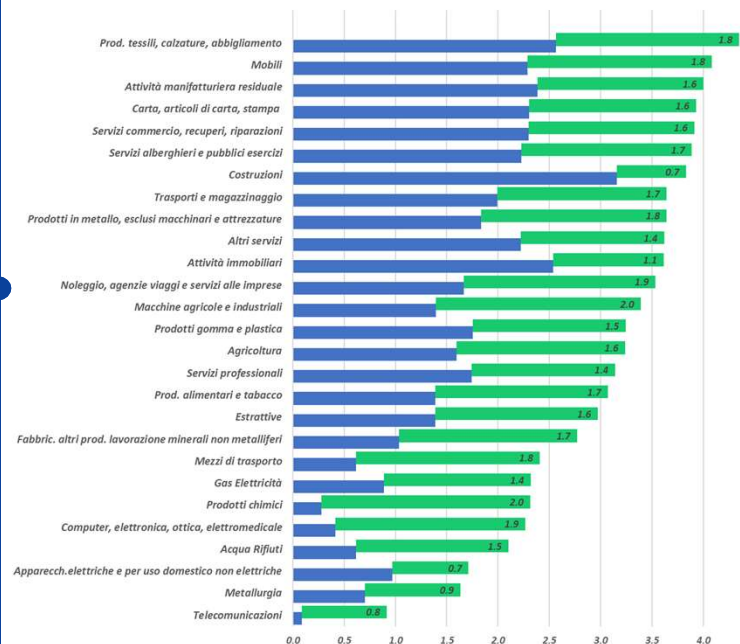
### STRESS SCENARIO ASSUMPTIONS

- Significant contraction of oil and natural gas flows from Russia starting from July 2022
- Stronger increases for natural gas and electricity, relatively less intense for oil
- Increases also for energy intensive commodities (aluminum, cellulose, ...)
- Return to lower prices in 2023 (via lower demand)

Prices in euro (2021=100)



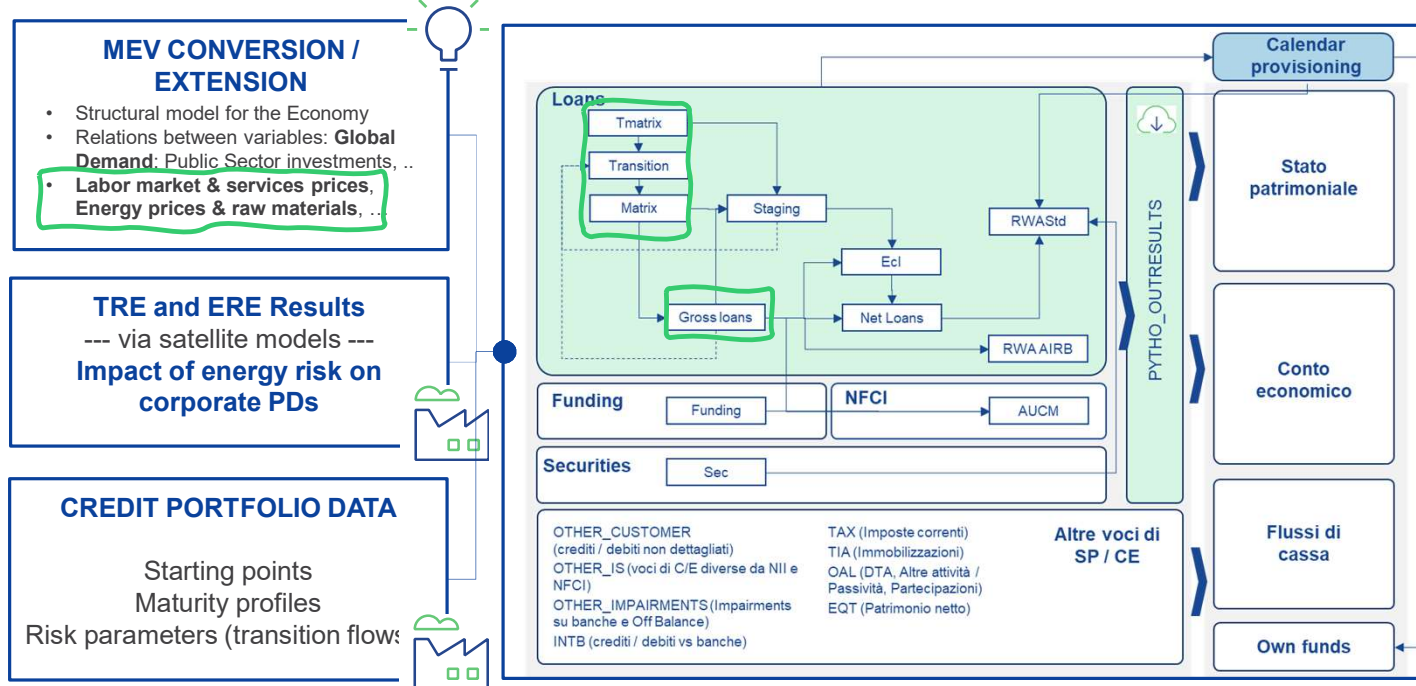
### IMPACTS ON CREDITWORTHINESS (changes in default rates%)





## 5 Impact analysis on bank's loans portfolio

MP – PYTHO advanced balance sheet simulation (credit components)



An integrated tool allows to produce coherent simulations of the bank's loans portfolio in single and multi-scenario contexts by integrating the evolution of market scenarios and the contribution of the managerial actions\*



(\*) new production, repricing, issuances, hypothesis of reconfiguration of the credit portfolio, NPE management plans, deleveraging actions, extraordinary finance operation...



### Input data

- **Macro economic Scenarios**
- **TRE and ERE results**
- **Bank's credit portfolio data** (starting point, maturity profiles)
- **Credit portfolio management Managerial actions**

### Calculation methodology

- Projection of net volumes through the application of transition matrices (merton approach)
- **NII** projections through cash flow mapping and calculation
- **LLP and RWA** projections through the application of analytical methodologies based on PD / LGD satellite models

### Reporting

- **All Credit KPI at cluster level:** NII, NFCI, LLP, RWAAIRB and STD, RAPM Measures

# Main takeaways

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- **Energy risks... another asymmetric crisis** (this means more attention to sectoral business models as well as supply chains)
- **Managing multiple shocks through appropriate simulation tools is not a nice-to-have** (this means evolving from sensitivity to scenario analysis)
- **Commodity prices scenarios can be very volatile** at this stage due to the peculiar relevance of the supply-related behaviours (rather of the demand) ...
- ... This is the reason why **managing volatilities and worst case scenarios can represent a very insightful tool**
- **Do not lose sight of the whole picture:** the management body is interested to the final effect on the bank' balance sheet, profitability and risk indicators



# Confidentiality

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