

# A data-driven approach for portfolio transition

Irving Fisher Committee - De Nederlandsche Bank  
Satellite Seminar on Sustainability data issues and central banks' experience  
4 October 2025, Amsterdam

The views expressed herein are those of the authors and do not necessarily reflect those of the Bank of Italy

---

Marco Fanari and Francesco Savino  
Financial Risk Management Directorate

# Overview

## Current practices on portfolio transition

Most practices rely on backward-looking information (carbon footprint)

Recent strategies include forward-looking metrics based on:

- complex metrics → ITR, Climate VaR
- commitment → SBTi targets

## Potential pitfalls

Complex metrics suffer from heterogeneity of assumptions and methodologies

Commitments are based only on SBTi

Metrics disregard the materiality of each activity for the transition

## Our analysis

blends carbon footprint and commitment data

feeds commitment data from multiple sources

focuses on material activities



**Commitment indicator**  
**Material activities**

# The commitment indicator (1)

The **commitment indicator** (CI) assesses how companies are aligned with a Net zero pathway.

It covers **four features**. Each gets a score of 0 (not verified) or 1 (verified). Therefore, CI ranges from 0 (no feature verified) to 4 (all features verified).

**Multiple data sources** are used: SBTi, MSCI, TPI.

Features	Description	Scores
Net Zero Ambition	Net-zero targets expected to be achieved by 2050 (2040)	0/1
Commitment on material emissions	Commitment to reduce material emissions over a time horizon of at least 3 years.	0/1
Medium term NZ alignment	Decarbonization trajectory in line with a 1.5°C scenario by 2030	0/1
Long term NZ alignment	Decarbonization trajectory in line with a 1.5°C scenario by 2050	0/1

## 1) Net Zero Ambition

The company has the ambition to achieve net zero emissions by 2050 (2040 power sector)

- SBTi: “Target set” for Net zero status
- MSCI: company’s net zero emissions ambition statement

## 2) Commitment on material emissions

The company is committed to reducing its material emissions\*

Target criteria: *(i) material emissions, (ii) company-wide scope, (iii) 3-year horizon*

- SBTi: active “Near-term target” or “Long-term target”
- MSCI: datapoint on at least one target comply with these criteria

\* Material emissions

Scope 1-3 emissions, ranked in decreasing order, cumulatively account for X% of the company’s emissions (e.g. 75%).

# The commitment indicator (2)



## 3) Medium-term Net zero alignment

The decarbonization trajectory is in line with the 1.5°C scenario in the medium-term

→ Comparison of company's vs sector-specific carbon intensity pathway by 2030

- SBTi: “Target set” for Net zero status & “1.5°C” for Near term target classification
- MSCI: “Net zero 2030”, science-based absolute emission reduction by 2030
- TPI: “1.5°C” for Carbon performance assessment in 2025 and 2035

## 4) Long-term Net zero alignment

The decarbonization trajectory is in line with the 1.5°C scenario in the long term

→ Comparison of company's vs sector-specific carbon intensity pathway by 2050

*similar to Medium-term Net zero alignment with horizon in 2050 (2040)*

# Why focusing only on material activities?

A broad portfolio application of CI could generate adverse effects in the presence of carbon constraints

Case	Company/sector	Materiality	Score Commitment	Carbon intensity	Preference
1	Alpha (company)	Y	3	High	-
	Beta (company)	N	3	Low	+
2	Gamma (sector)	Y	4	High	-
	Delta (sector)	N	4	Low	+
3	Epsilon (sector)	N	3,5	Low	+
	Zeta (sector)	N	2,5	Low	-

## Adverse selection effect

*Case 1* – Company Beta, engaged in a non-material activity and exhibiting lower carbon intensity, is preferred over Company Alpha

## Adverse allocation effect

*Case 2* – Sector Delta, with non-material activities and a lower carbon intensity, is preferred over Sector Gamma

*Case 3* – Sector Epsilon, with a higher score, is preferred over Sector Zeta, even though the commitments made by companies in both sectors are non-material

We propose a **focus on material activities**

# How to identify material activities


We employ the **NACE classification** based on the **contribution to total EU's emissions**.

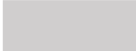
We consider:

- activities with the highest direct emissions in the economy (Scope 1&2)
- activities aimed at the production of goods and services whose use generates high emissions (Scope 3)

The included activities account for  
**88,4% of the EU's emissions**

Material NACE sectors (1)		Contribution to EU Emissions (2)	Intensity (3)
A	Agriculture, forestry and fishing	17,0%	1,62
B	Mining and quarrying	1,9%	0,88
C	Manufacturing	25,9%	0,27
	17 Manufacture of paper and paper products	1,0%	
	19 Manufacture of coke and refined petroleum products	4,3%	
	20 Manufacture of chemicals and chemical products	4,7%	
	22 Manufacture of rubber and plastic products	0,3%	
	23 Manufacture of other non-metallic mineral products	6,1%	
	24 Manufacture of basic metals	5,2%	
	25 Manufacture of fabricated metal products, except machinery and equipment	0,4%	
	27 Manufacture of electrical equipment	0,1%	
	28 Manufacture of machinery and equipment n.e.c.	0,3%	
	29 Manufacture of motor vehicles, trailers and semi-trailers	0,4%	
	30 Manufacture of other transport equipment	0,1%	
D	Electricity, gas, steam and air conditioning supply	22,2%	1,50
E	Water supply; sewerage, waste management and remediation activities	5,5%	1,01
F	Construction	2,0%	0,06
	42 Civil engineering	0,0%	
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	2,8%	0,04
	46 Wholesale trade, except of motor vehicles and motorcycles	1,4%	
H	Transportation and storage	17,5%	0,63
<b>Total</b>			
(2) Absolute emissions (MtonnCO2e)		<b>2.674,8</b>	<b>0,17</b>
(3) Intensity (kCO2e/€)			

 Contribution to Scope 1,2

 Contribution to Scope 3

# Portfolio construction

By way of example, we present the results of an optimization exercise using the commitment indicator

## Assumptions

Portfolio is constructed against a traditional benchmark (euro area equity, no financials)

## Optimization problem

Min ex-ante Tracking Error Volatility (TEV)

Constraints (vs benchmark)

- enhanced ESG score (at least 5%)
- enhanced WACI (at least 50% and 7% decarbonization annually)
- sector (max 1%) and issuer (max 2%)
- composite indicator



**Tilting towards increasingly ambitious levels**

from the unconstrained case...

...to progressively higher scores

## *Constrained quadratic optimisation*

$$\min_x x^T \cdot \Sigma_{total} \cdot x$$

sub

$$\sum_{i=1}^N x_i = 0$$

$$\left| \sum_{i=1}^{N_s} x_{i|sector=s} \right| \leq \bar{\delta}$$

$$lb \leq x \leq ub$$

$$w_{port} \cdot ESG \geq \overline{ESG}$$

$$w_{port} \cdot WACI \leq \overline{WACI}$$

$$w_{port} \cdot CI \leq \overline{CI}$$



# Results – exposure to committed companies

The overall exposure to material companies is independent of the commitment score level required by the constraint (*blue panel*)

As the commitment score constraint becomes more ambitious, the overall exposure to low (high-) committed companies decreases (increases) (*red/green arrow*)

In the extreme solutions,

- the cardinality of the portfolio is reduced (*dark grey*),
- a reduction in score 3 securities is also observed, along with an increase in exposure to score 4 securities (always included) (*amber/green arrow*)

Optimizations	No material		Material	
	N	Weight	N	Weight
Benchmark (3,07)	78	46,0%	81	54,0%
Unconstrained (3,07)	66	46,7%	70	53,3%
3,15	67	46,8%	68	53,2%
3,25	66	47,3%	65	52,7%
3,37	66	48,3%	55	51,7%
3,49	65	49,2%	43	50,8%
3,61	58	49,3%	33	50,7%
3,73	36	44,4%	28	55,6%

Material - Commitment score breakdown									
0		1		2		3		4	
N	Weight	N	Weight	N	Weight	N	Weight	N	Weight
4	1,5%	1	0,1%	22	9,2%	34	25,4%	20	17,7%
4	1,6%	1	0,1%	17	9,7%	29	23,5%	19	18,4%
4	1,0%	0	0,0%	16	8,8%	29	23,7%	19	19,7%
2	0,5%	0	0,0%	15	7,0%	29	23,4%	19	21,9%
1	0,2%	0	0,0%	8	4,6%	26	22,2%	20	24,7%
0	0,0%	0	0,0%	4	3,6%	19	18,6%	20	28,7%
0	0,0%	0	0,0%	2	2,9%	11	13,8%	20	34,0%
0	0,0%	0	0,0%	2	1,4%	9	12,2%	17	42,0%



# Results - TEV and carbon intensity quintiles

As the CI constraint becomes more ambitious:

- TEV increases more than proportionally (fig. 1); however, it is possible to favour committed companies, without deviating excessively from the benchmark (TEV<1%)
- Exposure to companies across the different carbon intensity quintiles remains largely stable (fig. 1)

Compared to the unconstrained case, portfolios built with the CI show higher exposure to brown companies (Q1; fig. 2) and, in particular, to transition-committed brown ones, while non-committed brown companies are further penalized

Figure 1. *Ex-ante TEV (left axis) and exposure to carbon intensity quintiles (right axis) across simulations*

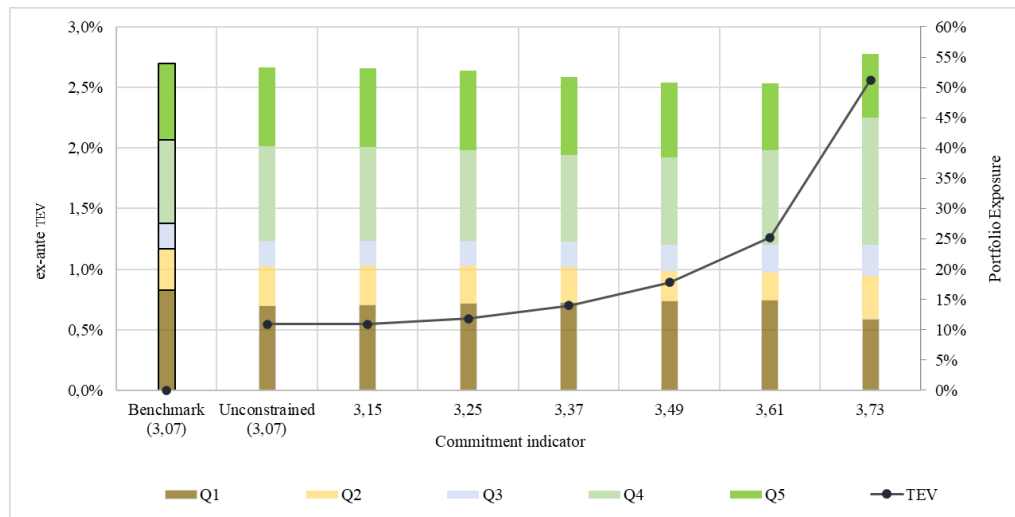
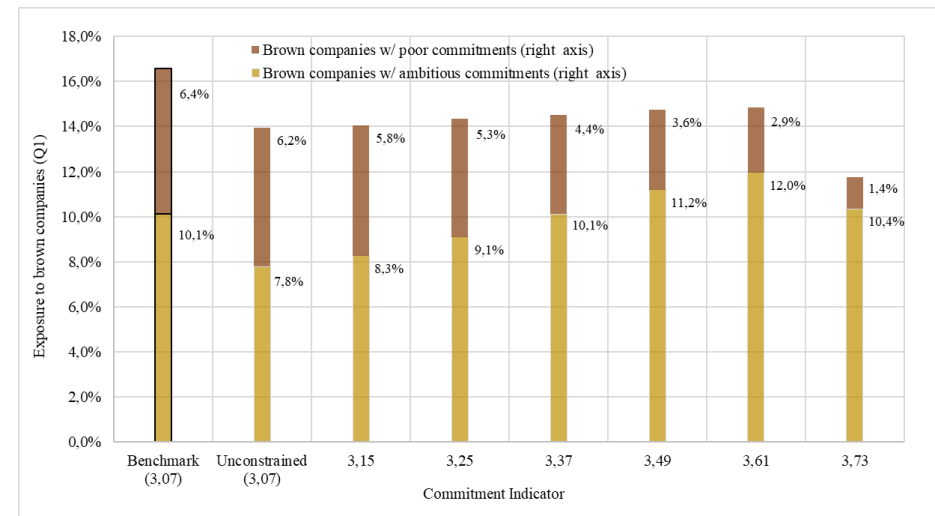


Figure 2. *Brown companies (Q1): overall exposure and breakdown on commitments*



# Thank you!

[marco.fanari@bancaditalia.it](mailto:marco.fanari@bancaditalia.it)

[francesco.savino@bancaditalia.it](mailto:francesco.savino@bancaditalia.it)