Methodology Insights

Sustainable Investment | Fixed Income

Sovereign Risk Monitor methodology

How to assess sovereign risk including ESG issues?

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Overview

Environmental, Social and Governance (ESG) is increasingly taken into consideration by financial and institutional players, yet it is still not integrated systematically in sovereign risk analysis. Recent efforts, like the United Nations' UN-PRI initiative, or the BIS' Green Swan reports, have taken up the issue to highlight the importance of the ESG and Sustainability viewpoint.

This paper lays out a methodology that integrates holistically, and objectively, ESG performance and traditional economic and financial metrics in the sovereign risk analysis. Developed by the London Stock Exchange Group's Beyond Ratings, Sovereign Risk Monitor (SRM) is a proprietary methodology that uses systematic analysis to offer a rigorous assessment of sovereign risk. SRM includes 69 indicators of sovereign creditworthiness from 146 economies assessed quarterly, within a statistical and econometric framework.

The main outcome of this innovative approach is a Scorecard for each country, which includes:

- Main strengths and weaknesses;
- Evolution and relative position of aggregate profile, pillar and risk theme scores;
- Ranking and deviation from regional and income peer group.

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1. Executive summary

Why consider ESG in sovereign risk analysis?

The inclusion of Environmental, Social and Governance (ESG) fundamentals in sovereign risk assessment has been gaining momentum in recent years, and international bodies are increasingly looking for greater consideration of ESG in sovereign risk analysis (*e.g.*, TCFD, EC HLEG, NGFS, ESMA, UN-PRI[1]). However, there is no consensus on how to take these characteristics into account in current approaches.

The traditional financial credit rating framework aims to assess the creditworthiness of a sovereign in the short to medium term but might underestimate long-term drivers of economic development. ESG materiality fills the gap between these two horizons and is now considered in investment decisions. The proposed methodology in the "Sovereign Risk Monitor" (SRM) has been designed to capture short, and long-term, sovereign risks using a new approach.

How can ESG be integrated into a holistic approach to sovereign risk analysis?

To be holistic, SRM is based on two risk profiles: (i) an economic and financial profile, which reflects traditional sovereign risk assessments, and (ii) a sustainability profile, which includes relative ESG performances.

From an objectivity perspective, SRM uses a systematic and quantitative assessment, mainly through historical econometric relationships.

What are the benefits of SRM?

SRM provides condensed, user-friendly, systematic and exhaustive Scorecards for 146 countries, on a quarterly basis.

The *Economic and Financial* profile scores reflect an economy's cyclical strengths and weaknesses. They are based on 28 indicators and can be relatively volatile.

The *Sustainability* profile scores show a country's structural ESG outlook and long-term sustainable drivers. These scores are based on 41 indicators, which are generally stable, and compare relative exposures to Environmental, Social and Governance risks

[1] Acronyms detailed in next part, below.

2. Why consider ESG in sovereign risk analysis?

International organizations, regulators and public authorities have recently focused on the important topic of ESG integration in sovereign risk analysis and how to better inform and support investors with their integration process.

2.1. ESG integration is gaining momentum

In December 2015, the Paris Agreement on climate change was adopted by 196 Parties at COP 21 in Paris. The goal of this legally binding international treaty is to limit global warming to well below 2°C (preferably to 1.5°C) by 2100, compared to pre-industrial levels.

In December 2015, the Financial Stability Board (FSB) established the industry-led Task Force on Climate-related Financial Disclosures (TCFD) to design a set of recommendations for consistent "disclosures that will help financial market participants understand their climate-related risks". TCFD published its recommendations in June 2017.

In January 2016, the French Article 173 of the Energy Transition Law defined the information obligations of institutional investors regarding their consideration of environmental and social parameters.

In December 2016, the European Commission established the High-Level Expert Group (EC-HLEG) on Sustainable Finance. This group was mandated to (i) steer the flow of public and private capital towards sustainable investments; (ii) identify the steps that financial institutions and supervisors should take to protect the stability of the financial system from environmental risks; and (iii) deploy these policies on a pan-European scale. In January 2018, the EC-HLEG on Sustainable Finance published its final report.

In December 2017, during the Paris One Planet Summit, the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) was launched. The Network's purpose is to help strengthen the global response required to meet the goals of the Paris Agreement, to enhance the role of the financial system to manage risks, and mobilize capital for green and low-carbon investments in the broader context of environmentally sustainable development. To this end, the Network defines and promotes best practices to be implemented within, and outside, of the Membership of the NGFS, and conducts (or commissions) analytical work on green finance.

In March 2018, the European Commission Action Plan on Financing Sustainable Growth acknowledged that it remains unclear to what extent sustainability factors are being considered by existing Credit Rating Agencies (CRAs), and invited the European Securities and Markets Authority (ESMA) to promote solutions that ensure CRAs fully integrate sustainability and long-term risks. In January 2021, ESMA called for legislative action on ESG ratings and assessment tools.

In October 2019, the World Bank launched its Sovereign ESG Data Portal – a free, open and easy-to-use online platform that provides users with sovereign-level ESG data. The portal is designed to help investors better align ESG analysis with key sustainable development policy indicators and analysis, increase data transparency and support private sector investments in emerging markets and developing economies[2].

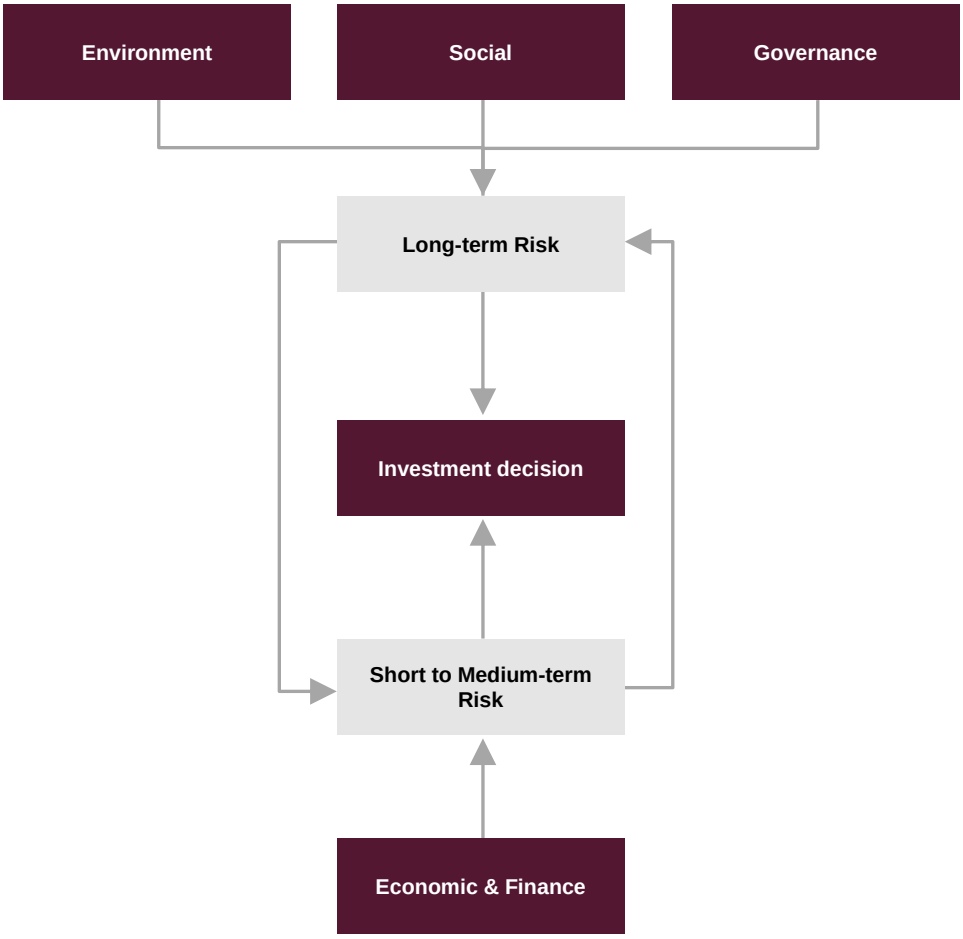
[2] Emerging Markets and Developing Economies (EMDEs) is an IMF terminology. It has to be opposed to Advanced Economies (AEs). See footnote 6 for more information on the IMF classification.

In *The green swan* book[3] (2020) from the Bank for International Settlements (BIS), the authors review ways of addressing those emerging risks within central banks' financial stability mandate. According to the report, "Traditional backward-looking risk assessments and existing climate-economic models cannot anticipate accurately enough the form that climate-related risks will take. These include what we call 'green swan' risks: potentially extremely financially disruptive events that could be behind the next systemic financial crisis. Central banks have a role to play in avoiding such an outcome, including by seeking to improve their understanding of climate-related risks through the development of forward-looking scenario-based analysis. But central banks alone cannot mitigate climate change."

2.2. ESG materiality in investment decisions

The challenge of sovereign risk analysis is to be able to reconcile and confront two distinct horizons: the first is the short-term nature of economic and financial challenges, taken until now into account in traditional rating models; the second is the long-term horizon of ESG factors, whose consequences may occur in years to come (see Figure 1).

Figure 1. Investment Decisions versus Long-term Risk



Source: Beyond Ratings.

[3] Patrick Bolton, Morgan Despres, Luiz Awazu Pereira Da Silva, Frédéric Samama and Romain Svartzman, 2020. "*Green Swan – Central banking and financial stability in the age of climate changes"*, Bank for International Settlements.

To foster consideration of long-term drivers in the sovereign risk analysis, over 120 investors signed the United Nations Principles for Responsible Investment (UN-PRI) statement on ESG in Credit Ratings in 2017, stating: “We recognize that environmental, social and governance factors can affect borrowers’ cash flows and the likelihood that they will default on their debt obligations. ESG factors are therefore important elements in assessing the creditworthiness of borrowers.”

As part of an ESG integration study in 2018, the Chartered Financial Analyst (CFA) Institute and the UN-PRI surveyed 1,100 practitioners worldwide. A significant number of investors thought ESG issues could affect sovereign bond valuations and expected their effects to increase over time. Above all, many investors had begun to take concrete actions by including ESG topics in their assessments[4].

3. How can ESG be integrated into a holistic approach to sovereign risk analysis?

The Sovereign Risk Monitor (SRM) has been developed by Beyond Ratings as part of work leading to the granting of a financial credit rating agency license by the European Securities and Market Authority in March 2019[5]. Moreover, the effectiveness of SRM in assessing the ESG performance of sovereigns has been highlighted by the World Bank[6][7].

SRM is a quantitative, relative and systematic approach, based on 69 indicators for 146 countries, divided into seven pillars of sovereign risk assessment.

Beyond Ratings calculates a score on a quarterly basis (depending on data availability) for each indicator, starting from 1999 until the end of the latest quarter. Each of the 69 indicators is the outcome of numerous adjustments – systematic to a large extent – based on public, private and proprietary data.

All indicators are combined at (i) a risk theme level and (ii) a pillar level to obtain an aggregated score. The aggregation derives from advanced statistical and econometric techniques discussed hereafter.

Finally, the scores are aggregated from each pillar in the profile from which they depend (*i.e., Economic and Financial*, as well as *Sustainability*) to obtain an aggregated score per profile.

3.1. From Economic and Financial profile to Sustainability profile

The general framework

SRM relies on the quantitative assessment of two profiles characterizing sovereign creditworthiness: (i) the *Economic and Financial* profile and (ii) the *Sustainability* profile (see Figure 2). These two profiles are structured around pillars, which consist of several risk themes, which, in turn, also include several indicators (see Figures 3-a and 3-b).

4 https://www.unpri.org/signatories/reporting-and-assessment/public-signatory-reports.

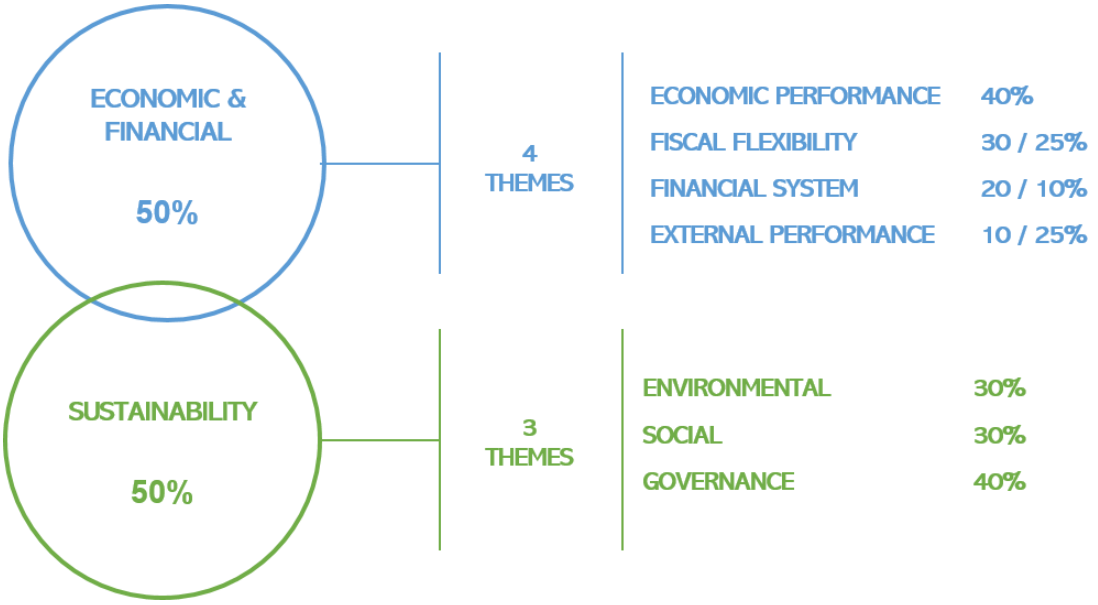
5 Subsequent to its acquisition by LSEG, Beyond Ratings renounced its CRA license in July 2019 and does not issue financial credit ratings.

6 Gratcheva, E. M.; T. Emery and D. Wang. 2020. Demystifying Sovereign ESG. Equitable Growth, Finance and Institutions Insight;. World Bank, Washington, DC. © World Bank.

7 Bouye, E and D. Menville. 2021. The Convergence of Sovereign Environmental, Social and Governance Ratings. Policy Research Working Paper;No. 9583. World Bank, Washington, DC. © World Bank.

At this stage, it is important to note that the calibration of the weights depends on the level of economic development, according to the dynamic IMF classification[8] of advanced economies (AEs) versus emerging market and developing economies (EMDEs). The inter-pillar weights are therefore different for three pillars in the *Economic and Financial* profile, based on the level of development of the economy; the first figure is for AEs, and the second for EMDEs (see Figure 2).

Figure 2. The SRM Framework



Source: Beyond Ratings.

Figures 3 provides the design of the two risk profiles that make up SRM.

The *Economic and Financial* profile is represented by four pillars, each of which includes several risk themes built on a set of indicators.

For example, the **Fiscal Flexibility** pillar has three risk themes, *i.e.*, Fiscal Policy, Budget Balance and Debt Burden. The Fiscal Policy risk theme is built on a set of two indicators, *i.e.*, the change in gross government debt and government revenues.

In the **External Performance** pillar, some indicators are taken into account only for AEs, *e.g.*, the short-term gross external debt in the external balance sheet risk theme, while other indicators are taken into account only for EMDEs, *e.g.*, the FX reserves in months of import in the Exchange Rate risk theme.

The *Sustainability* profile encompasses three pillars – and three sub-pillars in the **Environmental Performance** pillar – each of which includes several risk themes built on a set of indicators.

For example, the Climate sub-pillar in the **Environmental Performance** pillar includes two different risk themes, *i.e.*, Physical Risk (PR) and Transition Risk (TR). The TR risk theme is built on a set of three indicators, *i.e.*, the greenhouse gases (GHG) emissions *vs.* international benchmark, the imported GHG emissions and the decarbonized electricity mix.

[8] The main criteria used by the IMF to classify the world into advanced economies and emerging market and developing economies are (i) per capita income level, (ii) export diversification – so oil exporters that have high per capita GDP would not make the advanced classification because around 70% of their exports are oil-, and (iii) degree of integration into the global financial system. This classification is updated once a year. Further information on https://www.imf.org/external/pubs/ft/weo/2020/02/weodata/groups.htm.

Figure 3. Composition of SRM Profiles

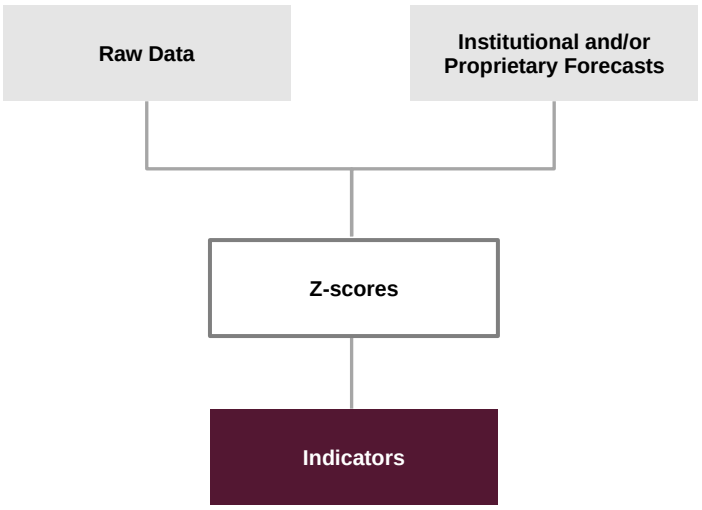
Profile	Pillar	(Sub-pillar)	Risk Theme	Indicator
Economic and Financial	Economic Performance		Economic Activity	CPI inflation rate; Unemployment rate; Real GDP growth rate per capita
			Economic Prosperity	Adjusted net national income; Size of government; USD GDP per capita; GNI per capita
			Monetary Policy	Monetary policy rate; Change in broad monetary aggregate
	Fiscal Flexibility		Fiscal Policy	Change in gross gov. debt; Gov. revenues
			Budget Balance	Gov. overall balance; Gov. primary balance
			Debt Burden	10Y gov. interest rate; Gov. interest payments
	Financial System		Credit Quality	Bank nonperforming loans
			Capital Adequacy	Regulatory Tier 1 capital
			Credit Gap	Credit to GDP gap
	External Performance		External Balance Sheet	Gross external debt; Short-term gross external debt (AE); Net international investment position (AE); Foreign currency gross external debt (EMDE); Gross external debt (% of current account receipts, EMDE); Gov. interest payments on gross external debt (EMDE)
			Capital Account	Foreign direct investment (EMDE)
			Exchange Rate	Exchange rate volatility vs USD (AE); FX reserves in months of import (EMDE); Change in FX reserves (EMDE)
Sustainability	Environmental Performance	(Energy)	Energy Policy	Electricity access; Energy consumption
			Fossil Fuel Risks	Coal composite index; Oil composite index; Gas composite index
			Energy Independence	Electricity independence
		(Climate)	Physical Risk	Health sector vulnerability; Food sector vulnerability; Human habitat sector vulnerability; Temperature trend
			Transition Risk	GHG emissions vs international benchmark; Imported GHG emissions; Decarbonized electricity mix
		(Resources)	Natural Resources	Natural resource sector growth; Ecosystem services sector vulnerability; Human habitat sector vulnerability
			Air & Water	Air pollution; Water sector vulnerability
	Social Performance		Human Capital & Innovation	R&D expenditures; Size of High-Tech sector; Education expenditures
			Health	Life expectancy; Health expenditures; Hospital beds (AE); Physicians (EMDE)
			Societal	Internet access; Urbanization rate; Female labor force participation
			Inequality	GINI index; Poverty rate; Income distortion index; Social contributions
			Employment	Unemployment rate; Youth unemployment rate; Labor force participation
	Governance Performance		Control of Corruption	
			Government Effectiveness	
			Political Stability & Absence of Violence	
			Regulatory Quality	
			Rule of Law	
			Voice & Accountability	

3.2. Quantitative framework: a relative and systematic approach

From Raw Data to Indicators

Figure 4 illustrates the general framework through which we transform raw data into indicators.

Figure 4. From Raw Data to Indicators



Source: Beyond Ratings.

- First (and in most cases[9]), a given data – to which we add, when appropriate, forecasts from international institutions and/or proprietary ones – is transformed into z-scores[10] for each country and each date. This first step allows us to assess the relative performance or relative risk linked to the initial data and removes any concerns about data scale.
- Second, the z-scores are transformed into continuous scores on an interval, ranging from 0 to 10[11], in accordance with the cumulated distribution of a standard normal distribution (see Figures 5 and 6 for more details) – 0 representing the worst score, and 10 the best.
- Third, so as to maximize the discriminating power between sovereigns, a linear dilatation is performed on all scores to ensure they range from 0 to 10[12] (included). This third phase allows us to calculate scores (*i.e.*, indicators).

Two different cases provide the general framework for these additional adjustments:

(i) When the optimum is a maximum, the higher the value for the data, the higher the value of the corresponding z-score, and the higher the indicator (see Figure 5).

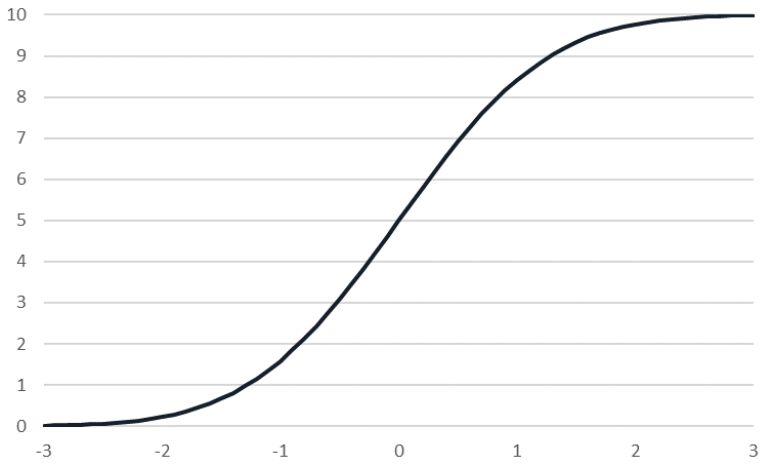
[9] In some cases (which remain rare), the initial data is transformed directly into an indicator without prior z-scores transformation; This is the case notably for real GDP growth rate, CPI inflation rate and exchange rate stability.

[10] For a raw datum denoted $X_{t,i}$ with t the date and i the country, $z\text{-}score_{X_{t,i}} = \frac{X_{t,i} - \overline{X_t}}{\sigma_{X_t}}$ with $\overline{X_t} = n^{-1} \sum_{j=1}^{n} X_t$ and $\sigma_{X_t} = \sqrt{(n-1)^{-1} \sum_{j=1}^{n} \left(X_j - \overline{X_t}\right)^2}$.

[11] The cumulated distribution of a standard normal distribution provides a value between 0 and 1 for a given z-score. This value is then multiplied by 10 for the needs of the model.

[12] The linear dilatation formula is the following: $\hat{X}_{t,i} = \frac{X_{t,i} - \min_{\hat{X}} X_t}{\max_{\hat{X}} X_t - \min_{\hat{X}} X_t}$.

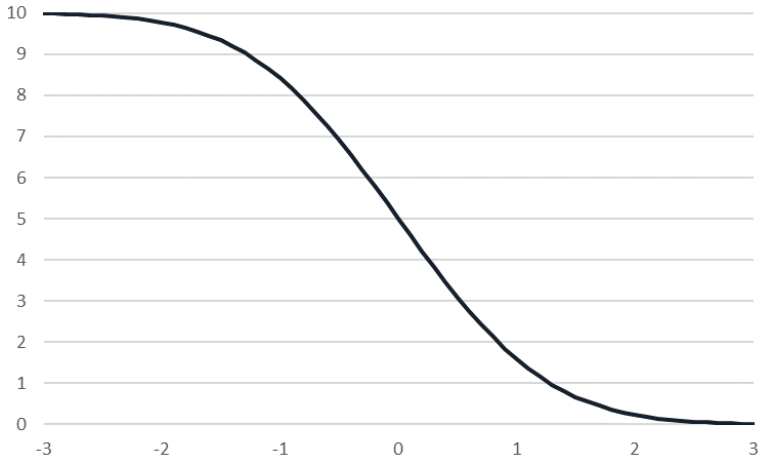
Figure 5. Standard Normal Cumulative Distribution Function (x axis: z-scores; y axis: scores; optimum: maximum)



Source: Beyond Ratings.

(ii) When the optimum is a minimum, the lower the value for the data, the lower the value of the corresponding z-score, and the higher the indicator (See Figure 6).

Figure 6. Standard Normal Cumulative Distribution Function (x axis: z-scores; y axis: scores; optimum: minimum)



Source: Beyond Ratings.

- In some cases, the general framework detailed above does not apply at all and the initial data are directly transformed into scores from 0 to 10. That is the case for the CPI inflation rate for which the optimum is an inflation rate of around 2% for economies belonging to the high-income group (around 4% for countries belonging to other income groups). When the inflation rate deviates from those targets (upwards or downwards), the score assigned to the data decreases. Moreover, this score decreases faster for downwards pressure on CPI inflation rate than upwards, underlining the higher risks linked to deflationary, rather than inflationary, pressures[13].

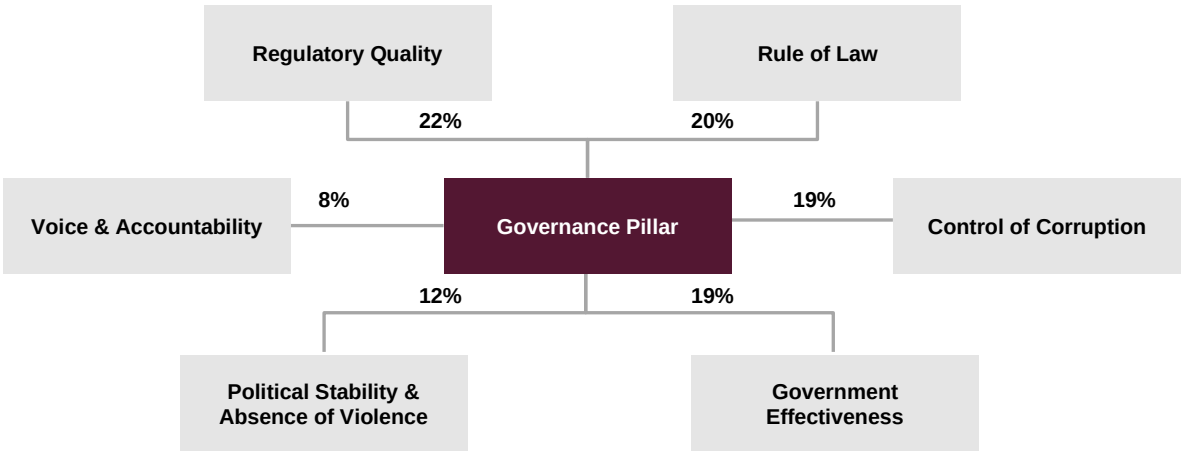
[13] See Irving Fisher's theory on deflation through debt.

- Finally, each indicator for each country at each date combines into four indicators weighted by the current quarter and the three preceding quarters, with a heavier weight given to the former. We call this time smoothing, or memory effect. Such smoothing allows to retain some memory over four quarters and to smooth potential one-off effects or very erratic data.

From Indicators to Pillars

Figure 7 illustrates the systematic approach to assigning a score to a pillar based on its underlying indicators. The chart shows a simple example which includes six indicators based on the **Governance** pillar within the *Sustainability* profile. This approach allows us to adjust each indicator in order to aggregate them afterwards and to derive a score in the form of a weighted average. Such score reflects the structural dynamics that could impact the sovereign risk. Again, the weights have been calibrated differently depending on the economies' level of development (*i.e.*, AEs vs. EMDEs). In Figure 7, weights are derived from AEs calibration.

Figure 7. From Indicators to Pillars



Source: Beyond Ratings.

The weights for each indicator for each pillar, *i.e.*, intra-pillar weights, have been calibrated thanks to an econometric modelling called Partial Least Squares (PLS), with Variable Importance in Projection (VIP) score added on (see Appendix 1 for further details).

This type of econometric modelling aims to be more robust than a simple linear modelling of the Ordinary Least Squares (OLS) type[14]. The PLS econometric modelling with VIP score added allows us to take into account potential issues linked to collinearity between each indicator and to rank the information value contained in each indicator within a pillar to estimate an aggregated measure of sovereign risk.

Turning to the endogenous variable, it is an aggregated sovereign risk measure[15] computed as the average of an ordered and non-linear numerical adjustment of the financial credit ratings of the

[14] The OLS econometric modelling does not take into account the potential issues linked to collinearity between each indicator. Indeed, it is obvious that some indicators are strongly correlated with others, *e.g.*, a country's general government overall balance is *de facto* strongly correlated with the general government primary balance of this same country. Therefore, the coefficients estimated through OLS are biased.

[15] This aggregated sovereign risk measure is a good proxy of a default probability.

three main Credit Rating Agencies[16] (CRAs). This aggregate measure of sovereign risk is therefore taken into account to calibrate the intra- and inter-pillar[17] weights of SRM.

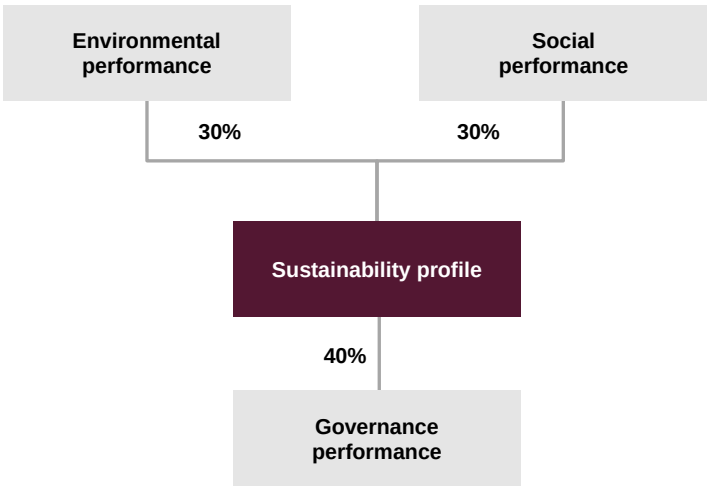
Once we have estimated the coefficients (thanks to the PLS modelling and the VIP scores) for each indicator within each pillar, we normalize the scores under a significance constraint[18] to obtain a weighting set with a 100% sum for each pillar.

The results derived from this advanced econometric framework have been calibrated on a data sample from Q4 1999 to Q4 2017[19]. Besides, the quality of out-of-sample estimates is reasonably similar to that of in-sample estimates. These tests enable us to establish relative stability for inter- and intra-pillar weights in time and space.

From Pillars to Profiles

Global weightings set per profile, *i.e.*, inter-pillar weights per profile (see Figure 8 for an example applied to the *Sustainability* profile). To do so, we use the same econometric framework as for the intra-pillar weights estimates. Inter-pillar weightings estimates per profile (derived from econometric regressions) have been marginally modified to grant them more or less importance from a prospective point of view[20] and make them more user-friendly.

Figure 8. From Pillars to Profiles



Source: Beyond Ratings.

[16] Standard & Poor's, Moody's Investors Service and Fitch Ratings, as publicly disclosed on their websites.

[17] Intra-pillar means within each pillar (*e.g.*, within the Social performance pillar of the *Sustainability* profile) while inter-pillar means between each pillar (*e.g.*, between the four pillars of the *Economic and Financial* profile).

[18] In order to not underestimate too much the weight of some indicators in the modelling, we assign a minimum value ($Minimum\ Weight = 1/2N$ with N the number of indicators constituting the pillar) below which no weight can be. If some indicators are assigned that minimum weight, all the other weights are once again normalised in order to obtain weightings set the sum of which is 100% for each pillar.

[19] The calibration period runs from Q4 1999 to Q4 2017, or 72 quarters. The choice of this period was motivated by several constraints. First, we wanted to have the most up-to-date data for some of the most lagging indicators (especially in the Environmental pillar). Second, we wanted to have enough degrees of freedom for the econometric estimates. Besides, thanks to some out-of-sample estimates, we were able to highlight the strong stability of the coefficients for the regressions in time and across economies.

[20] For the pillar related to environmental performances within the Sustainability profile for instance, it seems legitimate to us to grant more importance to these issues than empirical econometrical models generally do. Indeed, such issues are becoming more important to investors and are already starting to weigh on sovereign risk in some areas of the world more exposed to physical and/or transition risks from climate change. Moreover, overall resources depletion ought to be accounted for as a set of weak signals which are precursors for potential second-round effects in geopolitical and economic terms.

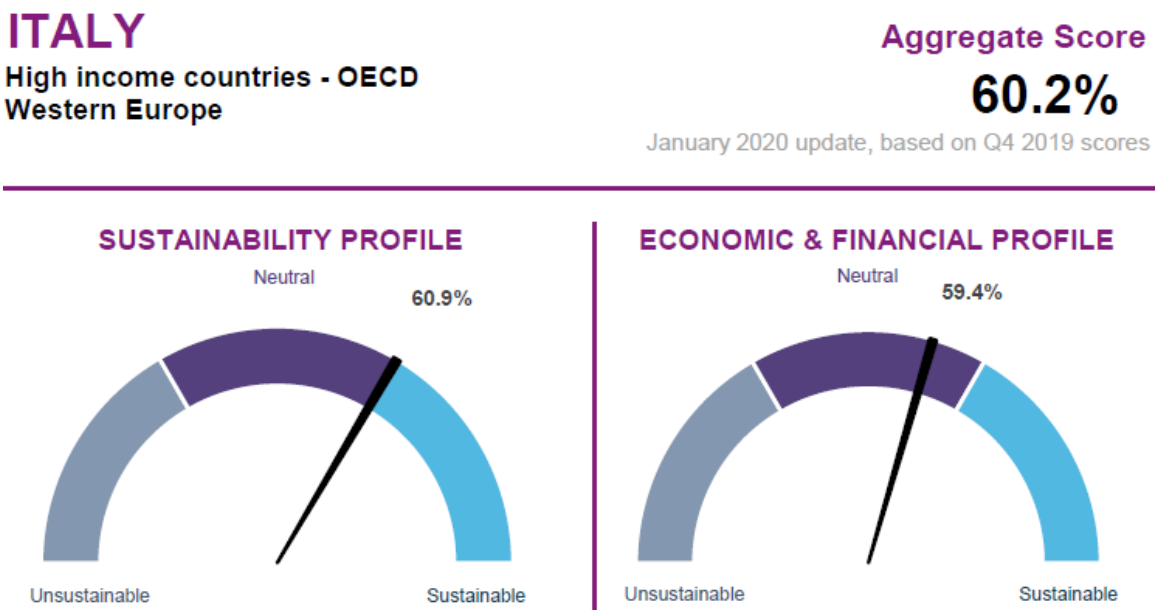
4. What are the main outputs of SRM?

SRM outputs enable us to provide quarterly a condensed, user-friendly, systematic and exhaustive Scorecards for all 146 economies. These Scorecards show, at a given date, the strengths and weaknesses of an economy through the two prisms of SRM risk profiles. To illustrate the main SRM contributions, the Scorecard for Italy is discussed in the following sections.

4.1. SRM Scorecards: summary

The summary section includes the country name, its income peers group and regional group, as well as the country's aggregate score (*i.e.*, equally-weighted average of the two profiles' scores). The release date is also provided. For the *Sustainability* profile and the *Economic and Financial* profile, aggregate scores are provided and a gauge is used to define the sustainability status of the score: (i) unsustainable, (ii) neutral or (iii) sustainable.

Figure 9-a. Scorecard Summary – Italy, Q4 2019



Source: Beyond Ratings.

Italy's score for the sustainability profile is 60.9%. It is in the neutral area, at the limit[21] of the Sustainable area.

For the economic and financial profile, the score is 59.4%, in the Neutral zone.

The 'Distance to Best-in-Class' analysis illustrated in the visual below compares the country to the 146 other countries and to its income peers' and geographical peers' averages. For each

[21] The boundaries between each area are not the same from one profile to another. These boundaries are empirical and reflect the distribution of scores at a given date. Overall, the distributions of the profile scores are divided into thirds and each score evolves exclusively from one of these thirds. For example, if the scores of a profile range between 20% and 80%, the breakdown into thirds would give us three areas of 20 percentage points, *i.e.*, from 20% to 40% for the Unsustainable area, from 40% to 60% for the Neutral zone, and from 60% to 80% for the Sustainable area.

individual pillar or risk theme, at each date, the scores are normalized between 0 to 100%, where the best and the worst performing countries respectively receive a score of 100% and 0%. The grey area represents the country's position with regards to its underlying risk themes. The black dotted line represents the income peers' average position and the blue dotted line represents the geographical peers' average position.

Figure 9-b. Scorecard Distance to Best-in-Class – Italy, Q4 2019

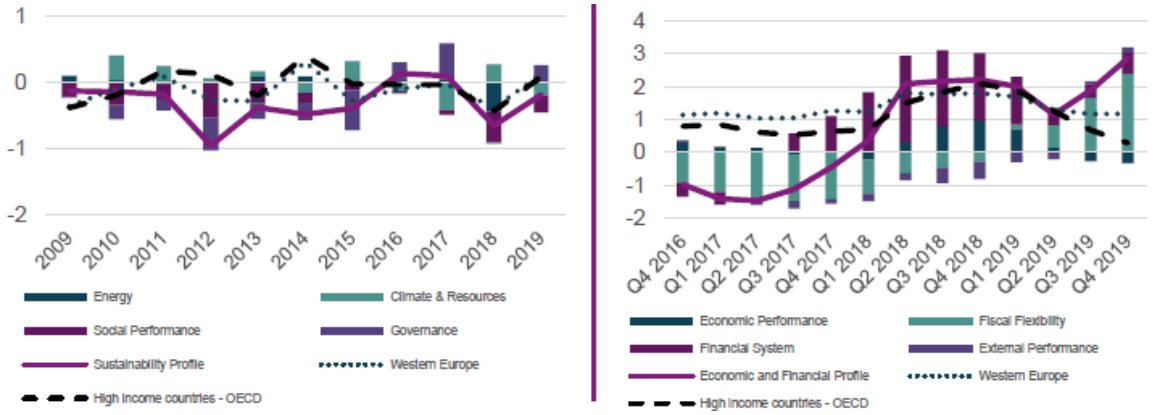
Source: Beyond Ratings.

In the *Sustainability* profile, Italy's weaknesses relate to the **Social Performance** and **Governance Performance** pillars as well as the Energy sub-pillar.

While in the *Economic* and *Financial* profile, Italy's weaknesses concern the **Fiscal Flexibility** and **Financial System** pillars.

The "Contribution to Sub-Score Evolution" outlines which risk themes have the most impact on the sub-score evolution over 10 years for the *Sustainability* profile, and over 12 quarters for the *Economic and Financial* profile. The purple line represents the evolution of the score, in percentage points. The black dotted line shadows the income peers' average score. The blue dotted line follows the geographical peers' average score.

Figure 9-c. Scorecard Contribution to Sub-Score Evolution – Italy, Q4 2019



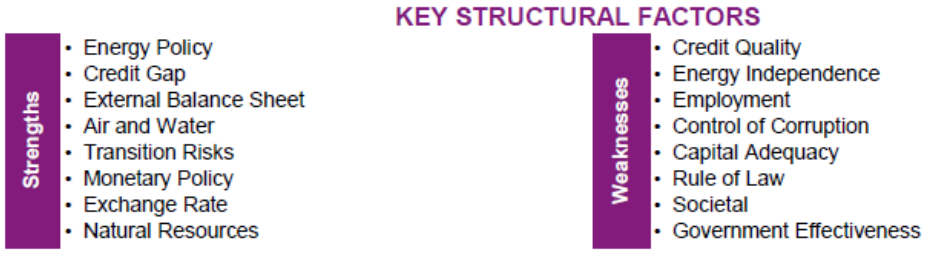
Source: Beyond Ratings.

The trend is downward for Italy's *Sustainability* profile. The **Social Performance** and **Governance Performance** pillars are the main contributors to the structural decrease in the *Sustainability* profile score.

Meanwhile on Italy's *Economic and Financial* profile, the trend is upward. The two structural weaknesses, *i.e.*, Fiscal Flexibility and Financial System, have been improving since 2017-2018 and are contributing positively to that evolution.

The 'Key Structural Factors' table lists the country's main strengths and weaknesses within the two profiles. It considers the score of each theme within its respective profile. Each risk theme score is compared to the peers' average performance to determine the country's overall strongest and weakest factors[22]. The peer groups are built following the World Bank's Atlas method and OECD membership, *i.e.*, OECD High-income countries, non-OECD High-income countries, Upper-middle-income countries, Lower-middle-income countries and Low-income countries.

Figure 9-d. Scorecard Key Structural Factors – Italy, Q4 2019



Source: Beyond Ratings.

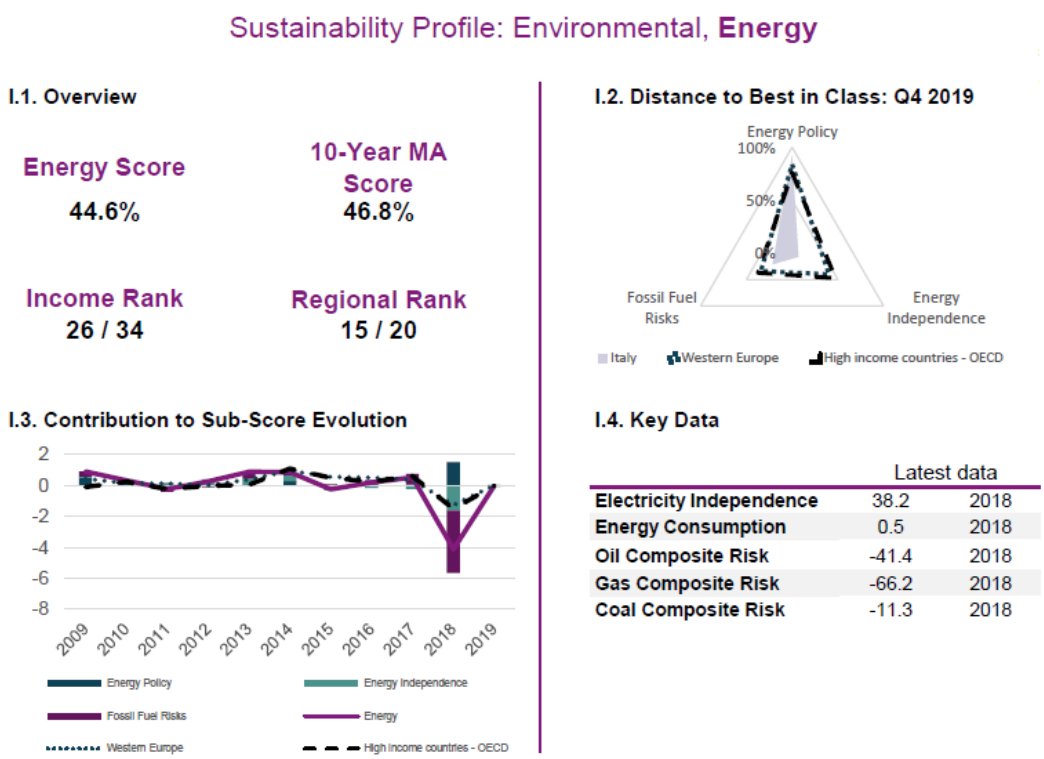
4.2. SRM Scorecards: the Sustainability profile

The detailed *Sustainability* profile delves deeper in each of its three pillars: **Environmental Performance** (*i.e.*, Energy and Climate & Resources sub-pillars), **Social Performance** and finally **Governance Performance**. Each pillar, or sub-pillar, is approached in the same way as in the summary. The dashboard provides (i) a summary with the pillar or sub-pillar aggregated score for the considered quarter, the 10-year moving average (MA) for long-term trend assessment and the ranks within income and geographical peers' groups, (ii) the distance to best-in-class for sub-scores, (iii) the contribution of sub-scores to performance over 10 years and (iv) some key data points[23].

[22] The peers' group median score for each risk theme is subtracted from each country's risk theme for the 29 risk themes. Then, we rank these scores based on the 29 risk themes of the considered country. Finally, the **top eight** and **bottom eight** scores of this ranking display the **strengths** and **weaknesses** respectively.

[23] The **key data points presented are the same for all countries** for comparison purposes. These data were selected (i) for their explanatory power in the calibration of the econometric model underlying SRM and (ii) their widespread statistical availability.

Figure 10-a. Scorecard Sustainability Profile, Environmental Performance Pillar, Energy Sub-Pillar – Italy, Q4 2019



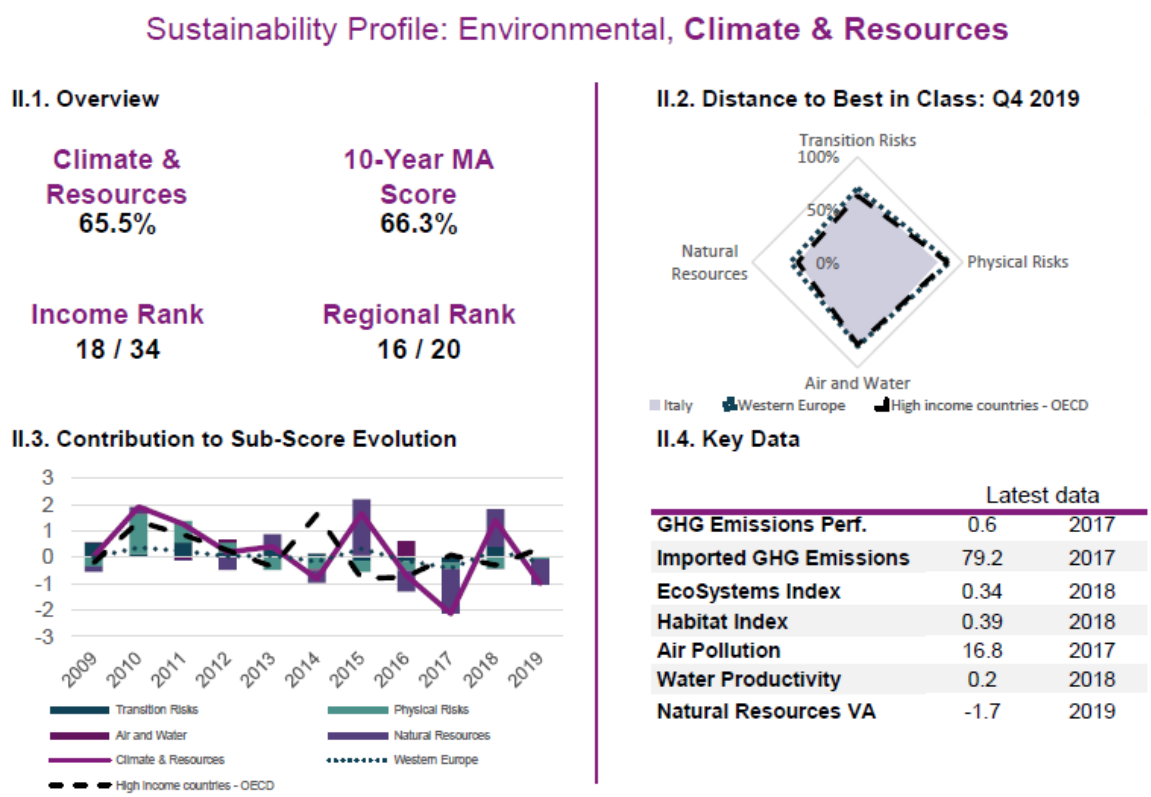
	Latest data	
Electricity Independence	38.2	2018
Energy Consumption	0.5	2018
Oil Composite Risk	-41.4	2018
Gas Composite Risk	-66.2	2018
Coal Composite Risk	-11.3	2018

Source: Beyond Ratings.

In terms of Energy management, Italy ranks 26th out of 34 within its income peer group. In 2018, the Fossil Fuel Risks sub-score decreased the Energy pillar score by more than 4 percentage points due to a higher dependence on natural gas in the energy mix.

Italy's main flaw stems from its electricity dependency, with an independence of only 38.2% in 2018 (compared to 105.7% in France or 57.8% in Spain).

Figure 10-b. Scorecard Sustainability Profile, Environmental Performance Pillar, Climate & Resources Sub-Pillar, Italy, Q4 2019



	Latest data	
GHG Emissions Perf.	0.6	2017
Imported GHG Emissions	79.2	2017
EcoSystems Index	0.34	2018
Habitat Index	0.39	2018
Air Pollution	16.8	2017
Water Productivity	0.2	2018
Natural Resources VA	-1.7	2019

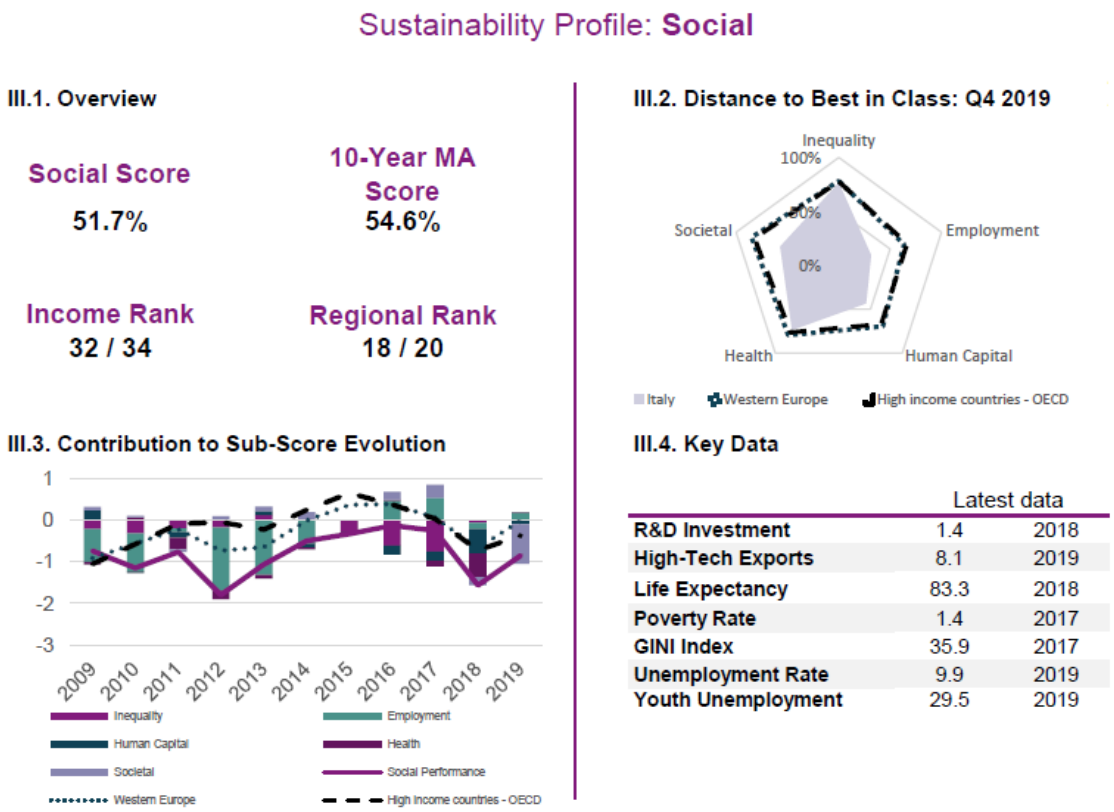
Source: Beyond Ratings.

Italy's exposure to climate and resources risks ranks around the average within its income peers group, while the country ranks 16 out of 20 within its regional peers group.

Still, air pollution[24] exposure in Italy is higher than in some of its European neighbors (16.8 in Italy compared to 11.8 in France and 9.7 in Spain, in 2017).

[24] Air pollution [exposure] is defined as the portion of a country's population living in places where mean annual concentrations of PM2.5 are greater than 10 micrograms per cubic meter, the guideline value recommended by the World Health Organization as the lower end of the range of concentrations over which adverse health effects due to PM2.5 exposure have been observed.

Figure 10-c. Scorecard Sustainability Profile, Social Performance Pillar – Italy, Q4 2019



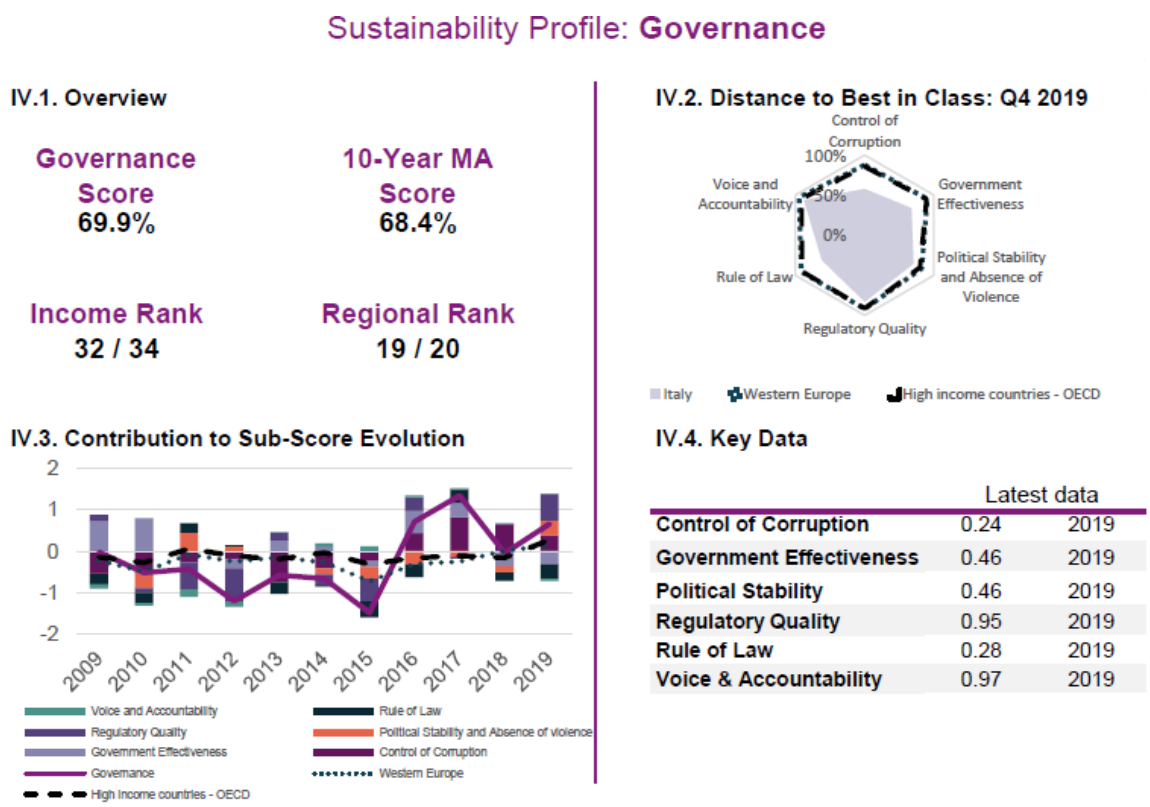
	Latest data	
R&D Investment	1.4	2018
High-Tech Exports	8.1	2019
Life Expectancy	83.3	2018
Poverty Rate	1.4	2017
GINI Index	35.9	2017
Unemployment Rate	9.9	2019
Youth Unemployment	29.5	2019

Source: Beyond Ratings.

Italian social score is poorly ranked, 32 out of 34 within its income peer group, mainly due to structural weaknesses in Human Capital & Innovation, Employment and Societal risk themes.

Unemployment is the main reason for such a low score, with a 9.9% unemployment rate and a 29.5% youth unemployment rate in 2019. Moreover, Human Capital is also a weak parameter for Italy with low R&D investment at 1.4% of the GDP in 2018, compared to 2.2% in France and 3.1% in Germany

Figure 10-d. Scorecard Sustainability Profile, Governance Performance Pillar – Italy, Q4 2019



	Latest data	
Control of Corruption	0.24	2019
Government Effectiveness	0.46	2019
Political Stability	0.46	2019
Regulatory Quality	0.95	2019
Rule of Law	0.28	2019
Voice & Accountability	0.97	2019

Source: Beyond Ratings.

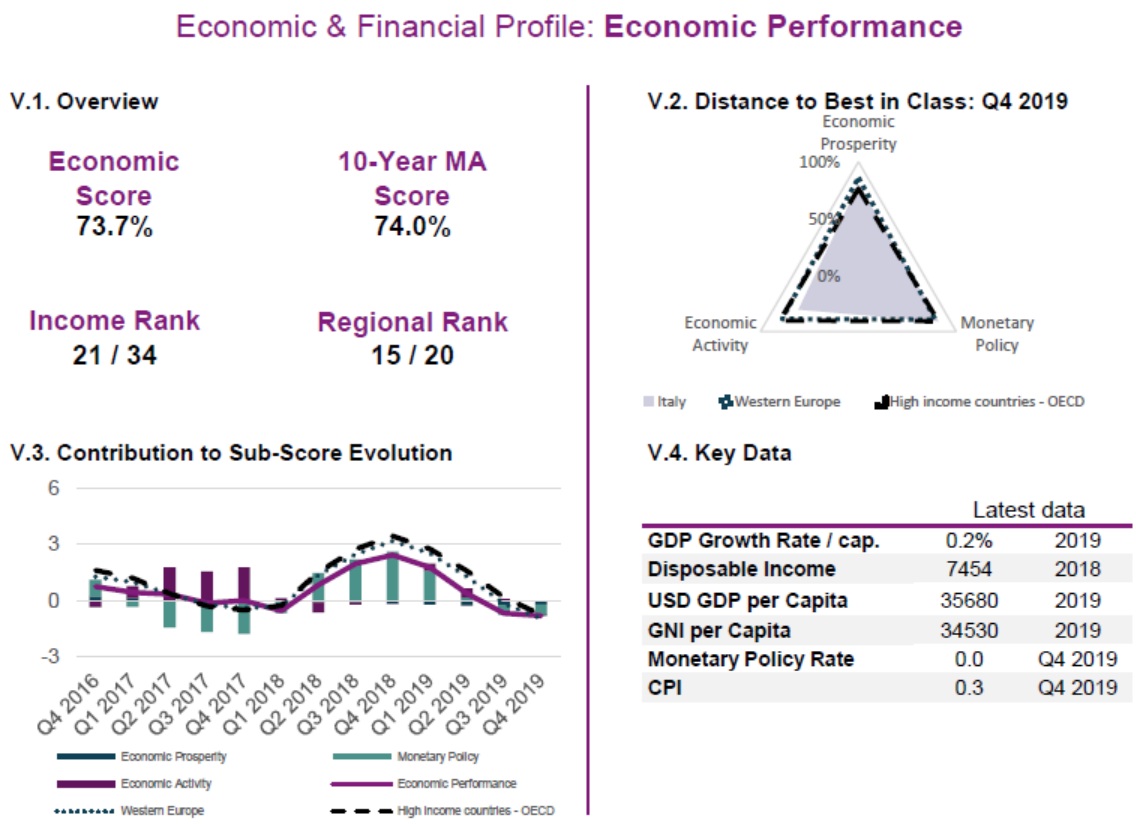
Italian governance score is weaker than its peers, ranked 32nd out of 34 within its income peer group, notably due to a poor performance on the pillars “Control of corruption”, “Rule of law” and “Government effectiveness”.

Control of corruption is 0.24 in 2019, compared to 1.30 for France. Government effectiveness is also weak, as a consequence of the Italian political instability, with 0.46 in 2019 compared to 1.59 for Germany.

4.3. SRM Scorecards: the Economic and Financial profile

Similarly, the detailed *Economic and Financial* profile delves deeper in each of its four pillars: **Economic Performance**, **Fiscal Flexibility**, **External Performance** and finally **Financial System**. Again, each pillar is approached in the same way as in the *Sustainability* profile. The dashboard provides (i) a summary with the pillar aggregated score for the considered quarter, the 10-year moving average (MA) for long-term trend assessment and the ranks within income and geographical peers’ groups, (ii) the distance to best-in-class for sub-scores, (iii) the contribution of sub-scores to performance over 12 quarters and (iv) some key data points selected in the same way as for the *Sustainability* profile.

Figure 11-a. Scorecard Economic & Financial Profile, Economic Performance Pillar, Italy, Q4 2019

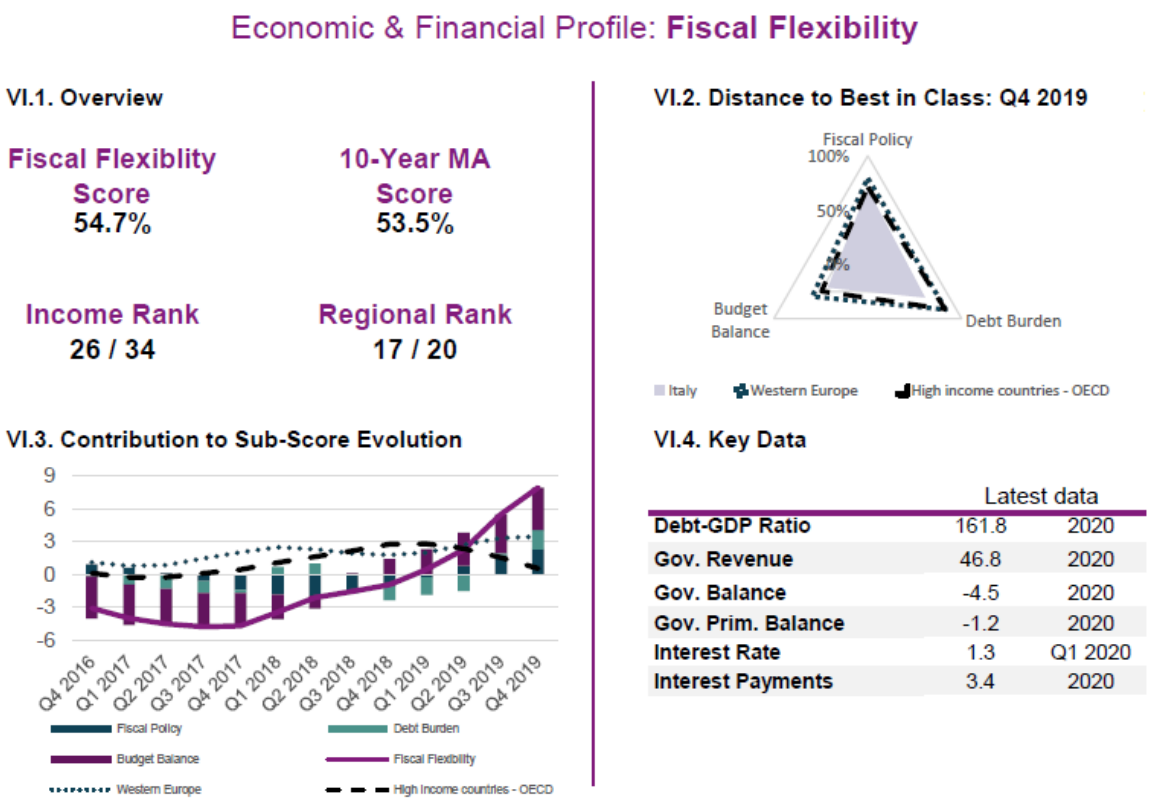


Source: Beyond Ratings.

Italy ranks 21 out of 34 within its income peers group. This is partly explained by a low rate of GDP growth per capita of 0.2% compared to 1.6% in Spain or 0.6% in France, in 2019.

The contribution of monetary policy to economic performance was strong, particularly in 2018, as a result of quantitative easing policies conducted by the European Central Bank.

Figure 11-b. Scorecard Economic & Financial Profile, Fiscal Flexibility Pillar – Italy, Q4 2019



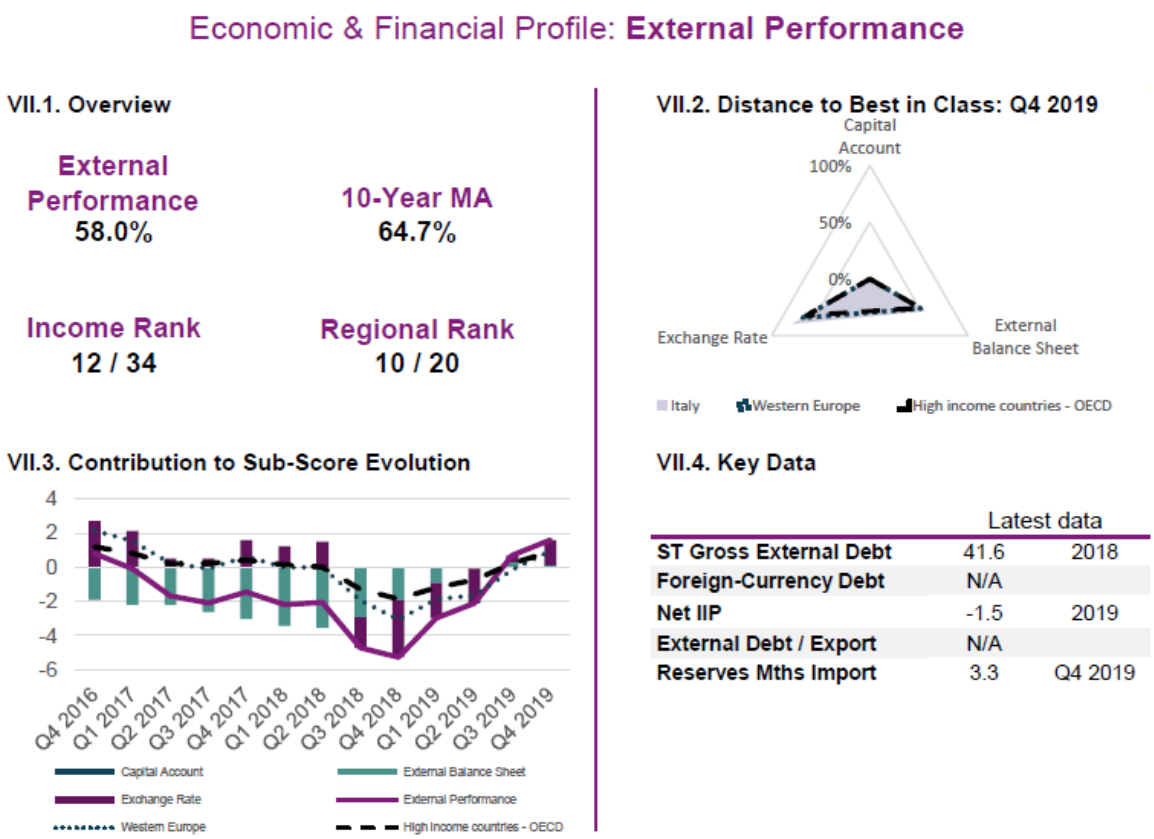
	Latest data	
Debt-GDP Ratio	161.8	2020
Gov. Revenue	46.8	2020
Gov. Balance	-4.5	2020
Gov. Prim. Balance	-1.2	2020
Interest Rate	1.3	Q1 2020
Interest Payments	3.4	2020

Source: Beyond Ratings.

Italy is the most indebted economy of the Eurozone, at 161.8% of GDP according to the 2020 estimates, well above the c. 100% on average in the Eurozone.

In addition, as per the latest available data Italy raises debt carrying an interest rate of 1.3%, which is higher than its Irish (0.9%) or Spanish (0.3%) counterparts.

Figure 11-c. Scorecard Economic & Financial Profile, External Performance Pillar – Italy, Q4 2019



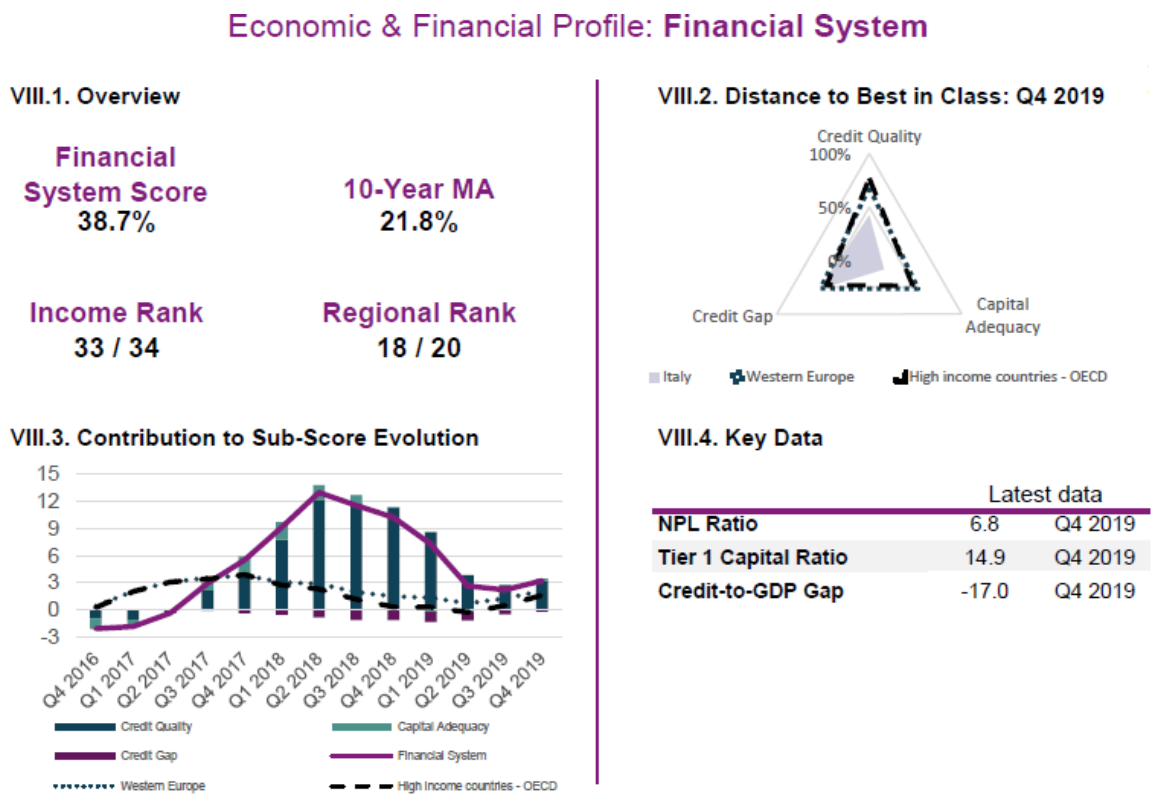
	Latest data	
ST Gross External Debt	41.6	2018
Foreign-Currency Debt	N/A	
Net IIP	-1.5	2019
External Debt / Export	N/A	
Reserves Mths Import	3.3	Q4 2019

Source: Beyond Ratings.

In terms of external performance, while the trend has worsened over the past 10 years, Italy ranks particularly well: 12 out of 34 within its income peer group and in the middle of the ranking within its regional peer group.

This performance was driven by a negative, but relatively weak, net international investment position (Net IIP) compared with its European peers in 2019 (-1.5% of GDP in Italy vs.-22.9% in Spain or -182.4% in Ireland).

Figure 11-d. Scorecard Economic & Financial Profile, Financial System Pillar – Italy, Q4 2019



Source: Beyond Ratings.

The Italian financial system is structurally challenged, ranked among the lowest within its income and regional peer groups.

This low score stems both from low credit quality, with a non-performing loan (NPL) ratio of 6.8% in Q4 2019 (compared to 3.2% in Spain or 2.5% in France), and from low capital adequacy due to a low Tier 1 Capital Ratio of 14.9%25 (vs. 23.1% in Ireland and 16.0% in France).

[25] Under Basel III, the minimum Tier 1 Capital Ratio is 10.5%, which is calculated by dividing the banks' Tier 1 capital by their total risk-weighted assets.

Appendix

Appendix 1: Partial Least Squares (PLS) regression and Variable Importance in Projection (VIP) score

The aim of the Sovereign Risk Monitor is to produce a comprehensive and relevant assessment of sovereign risk. To design such a framework, we have developed a statistical and econometric methodology capable of analyzing multiple indicators and extracting valuable sovereign risk-related information. Then, we outline the statistical and econometric methodology and describe the key steps leading to the estimation of our two different profiles.

Sovereign risk is often influenced by numerous indicators, covering topics as wide-ranging and as different as economic performance, public finances, social performances, etc. but also exposure to climate change or the quality of governance. Some indicators that make up these topics are uncorrelated, while others show a strong correlation. Therefore, extracting precise and specifically sovereign risk-related information cannot be undertaken by using simple regression techniques as the results would be biased. To circumvent this issue, we use specific regression techniques to estimate the weight of each indicator in predicting an aggregated sovereign risk measure. The model we use is as follows:

$$Y = \alpha + \sum_{j=1}^{N} \beta_j X_j + \epsilon$$

where:

- Y is the aggregated sovereign risk measure with $Y = (Y_1, \dots, Y_n)^t$, t the number of quarters and n the number of countries;
- For $j = 1, \dots, J$, X_j is the j-th explicative indicator X matrix and J the number of indicators;
- β_j is the j-th coefficient. As already stated, it cannot be estimated by a simple Ordinary Least Squares regression as this estimator would be biased.

These indicators can present strong correlations (*e.g.*, between economic performances indicators hence, to consider this specificity of the selected data, we use Partial Least Squares (PLS) regressions. That econometric framework, developed by Wold[26] in the 1960s, enables the construction of predictive models in the presence of many correlated independent variables. It finds orthogonal components – thus eliminating the multicollinearity issue – of the X matrix that explain as much as possible the covariance between X and Y. Then, this breakdown of X is used in the regression to predict Y[27]. More precisely, the PLS regressions follow several steps:

(i) The PLS regressions produce a matrix W such as $T = XW$, where T is the factor score matrix and W is estimated such as to minimize collinearity and maximize the covariance between the explanatory and endogenous variables;
(ii) We estimate the matrix Q so that $Y = TQ + E$;
(iii) We estimate the matrix P so that $X = TP + E'$;
(iv) We compute $\beta = WQ$.

To estimate the T matrix, the standard algorithm for computing PLS components is used, *i.e.*, Nonlinear Iterative Partial Least Squares (NIPALS) algorithm. It uses all the matrices defined above to estimate W and then compute T.

[26] Wold, H., 1966, "Estimation of principal components and related models by iterative least squares", in P.R. Krishnaiaah (Ed.), *Multivariate analysis*, pp.391-420.

[27] Abdi, H., 2003, "Partial Least Squares (PLS) Regression", The University of Texas at Dallas.

The aim is not to predict directly Y but rather to find the optimal weights of each indicator in SRM. So, the β coefficient we find in the regressions are not used directly. Instead, the Variable Importance in Projection (VIP) score is used. It represents the summary of the importance of each indicator in finding the components of the X matrix[28] during the first step of the PLS regressions. Formally, it is the weighted sum of squares of the PLS weights (the W matrix), which considers the explained variance of each dimension. It is used to select relevant predictors according to their value. In the academic literature, the VIP score is statistically significant if it based above a given threshold ranging from 0.8 to 1[29]. However, as we do not want to exclude too many indicators, we use the VIP scores directly to compute the weights. This approach remains relevant because VIP scores higher than 0.8 account for more than 80% of SRM indicators. The last 20% are rarely below 0.5.

[28] Palermo, G., P. Piraino, and H.-D. Zucht, 2009, "Performance of PLS regression coefficients in selecting variables for each response of a multivariate PLS for omics-type data", *Advances and Applications in Bioinformatics and Chemistry: AABC*, *2*, pp. 57–70.

[29] Chong, I.G., and C.H. Jun, 2005, "Performance of some variable selection methods when multicollinearity is present", *Chemometrics and Intelligent Laboratory Systems 78*, pp. 103–112.

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