Sovereign Debt Methodology

A Sovereign Risk Analysis

Methodologies

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This methodology replaces the "Sovereign Debt Methodology" of September 2012.

"This methodology takes effect on May 19th, 2017".

This document ***details the HR Ratings methodology for assessing sovereign risk on global scale***. This methodology includes core concepts in terms of the dimensions of sovereign risk and describes the models and criteria used to assess that risk. ***The methodology compares the sovereign with similar sovereigns with a broad cross-section***. Additionally, ***the methodology considers long-term projections*** in terms of the evolution of key debt metrics for the sovereign analyzed. We also consider ***the ability of the sovereign, and its economy, to deal with stress***. The methodology places importance on the sovereign's external accounts, which flows determine the external liquidity of the economy. The sovereign's access to global credit markets, an important element in the risk assessment, depends on this liquidity.

- The assessment of sovereign risk seeks to ***determine the ability and the willingness to settle its debt obligations***, both explicitly and implicitly.

- ***Our methodology involves three quantitative assessment models*** and various ***qualitative adjustments*** to determine the level of sovereign risk.

- The ***Relative Valuation Model*** measures the performance of the sovereign, comparing it to similar sovereigns through information provided by the International Monetary Fund. The metrics obtained are grouped into four analytical dimensions. This evaluation is based on recent performance and expected performance in the short, medium and long-term.

- These analytical dimensions are: (i) national wealth, (ii) public finances, (iii) monetary policy, and (iv) external accounts.

- The ***HR Ratings Base Projection Model*** presents our estimate of important fiscal and external factors for the coming years.

- The ***HR Ratings Stress Projection Model*** presents these same variables, over the same timeline, but according to different circumstances, representing adverse conditions.

- *The methodology also includes a comparative analysis* of the variables that describe the ***political and social environment of the sovereign***. These are assessed according to a **Social-Political Model**.

- The ***Social-Political Model*** uses information provided by the World Bank and the UN and measures the institutional quality of the sovereign.

- ***Adjustment Considerations*** are applied after the Initial Rating has been determined, which could alter the rating either up or down. Then, the ***Difference Considerations*** separate, where necessary, the global rating in local currency from the global rating in foreign currency.

- The ***Final Rating*** is determined based on all the factors described above.

Basic Concepts and Definitions of Risk

Obligations and Characteristics of the Sovereign

The sovereign risk rating HR Ratings assigns refers to the debt obligations issued by a nation-state´s national/central government, extending this definition to any entity whose debt obligations are explicitly backed by the sovereign[1]. Lastly, the sovereign risk rating may also extend to entities whose debt obligations are, in the opinion of HR Ratings, backed implicitly by the sovereign.

The sovereign risk assessment measures the willingness and the ability of the sovereign to meet its explicit and implicit debt obligations (or debt backed explicitly or implicitly by the sovereign). We assume that these obligations include reasonably maintaining the stability of the sovereign's currency, assuring the investor in government debt of the ability to convert, his local currency holdings into foreign currencies in free market conditions as well as to transfer foreign currency to other jurisdictions.

The possible failure to meet these obligations represents the following dimensions of risk: 1) Currency debasement, 2) Conversion, and 3) Transfer or Repatriation.
In terms of the ability and willingness to pay, it's important to identify the characteristics and attributions of the sovereign. First, the sovereign can impose taxes and restrictions on its population. Non-sovereign entities cannot do this. However, it's important to recognize the practical limitations of this power in times of crisis.

Subnational states (or government entities) share the ability to impose taxes and restrictions with the sovereign. These restrictions generally do not extend to controls on the conversion of local currency and its transfer to other sovereign jurisdictions.

Subnational entities do not share another characteristic with the sovereign, the ability to "print" its own currency. The volume of currency a sovereign can issue depends on its reserves. If a sovereign's currency is in demand by central banks and financial institutions around the world, the currency is less likely to generate inflation at home.

Monetary Policy and Sovereign Risk

The primary ability to print money is what, in the HR Ratings methodology, distinguishes a sovereign rating on local scale from a sovereign rating on global scale. The local scale does not consider the three risks mentioned above. Therefore, the ability to print money implies the sovereign rating in local currency is usually "HR AAA (L)".

Given the importance of this power, which implies the ability to debase the currency, modern states have developed mechanisms to separate this attribution from the fiscal authority; giving it instead to specialized entities, recognized as autonomous Central Banks. The HR Ratings methodology assumes that, in general, the autonomy of a Central bank, in practical terms, may be limited in times of stress.

It is possible to distinguish the autonomy the respective Central Banks may have between sovereigns. Additionally, different degrees of autonomy may carry significant

[1] These entities include sub-nationals and state-involved companies.

consequences in terms of the short and long term ratings. A Central Bank with limited autonomy in terms of its responsibility for maintaining the value of the sovereign's currency, could give the sovereign a broad ability to avoid liquidity problems in the short term. Meanwhile, a Central Bank with greater autonomy and central responsibility for oversighting the value of the sovereign's currency, could expose the sovereign to a liquidity and solvency crisis.

HR Ratings considers these factors in its assessment of inflation in its models and in the adjustment considerations.

Given the importance the HR Ratings methodology places on the primary ability to print money, it may be concluded that debt in local currency would generally have a higher rating than debt denominated in foreign currency (which the sovereign cannot print). However, this is not the case for debt on global scale. A central assumption in this methodology is that, generally, the assessment of risk for debt in local and in foreign currency is the same. Certain circumstances that are or extraordinary to each sovereign may differentiate these ratings and could alter the global rating in both currencies either up or down.

HR Ratings recognizes the advantage that the ability to print money (assuming the Central Bank has a limited degree of autonomy) has on the sovereign's rating for its debt in local currency. However, this advantage is limited to the extent to which a lax monetary policy would produce strong or unexpected inflation, debasing the currency. In an extreme case, this would represent a real default by the sovereign. Without needing to exacerbate the situation, a lax monetary policy could lead to run where investors are looking to convert and transfer their assets to other currencies and other jurisdictions. To prevent such a situation, the sovereign could restrict the ability to convert and to transfer. This risk could be extended to global investors in debt in local and foreign currency. It would therefore be difficult to distinguish, in terms of the relative risk assessment, between the debt on global scale in local currency and in foreign currency.

When debt in foreign currency requires payment be made in another jurisdiction, this risk could be lower than the risk held by the counterparty in local currency payable in the sovereign's jurisdiction.

Lastly, we cannot discard the possibility that a sovereign will implement policies to devalue a currency (in real terms). The goal of such a policy would be to support the economy's external accounts. With solid external accounts, the sovereign would be able to meet its obligations in foreign currency while simultaneously debasing the local currency, severely impairing the credit quality of its debt in local currency.

In the case of debt denominated in foreign currency, the payment risk refers to the government's ability to acquire sufficient foreign currency to service its debt. Here, the Central Bank does not function as the source for an unlimited supply of credit, therefore this risk depends on the size of the international reserves, the government's direct access to gains from certain exportations, and the dynamic of the payment balance.

Consequently, the greater a government's access to foreign currency, the lower the pressure on the international reserves, and the rating will be higher. We can't ignore the fact that foreign currency can also determine the nominal level of debasement, therefore access to foreign currency is a partial determining factor for the risk of devaluation. Meanwhile, the risk of transfer refers to the ease with which investors can transfer their gains in foreign currency out of the country.

Our methodology places importance on the solidity of the external accounts. But this is not solely associated with the need to measure the sovereign's ability to service its debt denominated in foreign currency. Strong external accounts also reduce the risk of encouraging a debasement of the local currency and imposing restrictions on conversion and transfers of resources obtained by investors on sovereign debt denominated in local currency.

Our methodology does not cover exact metrics that would allow us to distinguish between a debasement of the currency and unexpected inflation. However, conceptually, a debasement would be related to a monetary policy whose goal is to produce inflation that reduces the value of the debt in local currency. A policy of debasement could also be such that the Central Bank, to stimulate growth, could put in risk the future value of the currency.

The previous analysis focuses on the possible differentiation between the debt risk denominated in local and in foreign currency. However, within the concept of debt in local "currency", there may be a differentiation between debt denominated in local currency and debt payable in local currency but linked to an inflation index. Obviously, the exposure of the latter to unexpected inflation is limited. There is a risk associated with the possibility that the authority may manipulate their price index so as to not adequately reflect inflation.

However, even with this limitation, it is possible that our methodology will draw a differentiation between the sovereign risk rating in local currency and in local currency but linked to inflation. The latter type of debt remains subject to the risk of conversion and transfer. Additionally, indexed debt does not protect against the risk of debasement, which implies devaluation in real terms vs. other currencies.

A very important factor to consider is the condition of a currency as a reserve currency. In this case, printing money could satisfy international demand, and with this mitigate the ability of the volume of new printing to produce inflation.

Country Risk

The HR Ratings methodology distinguishes between the country risk and the sovereign risk, despite these concepts being closely related. Sovereign risk refers to ability and willingness of a central government to meet its debt obligations, as defined in the above analysis. Country risk refers to a certain set of legal and institutional conditions that could jeopardize the ability of a non-sovereign debtor to generate the resources necessary to meet its contracted obligations. In terms of creditors (on sovereign and non-sovereign debt), country risk refers to the possibility that the same set of factors could weaken the creditor's ability to collect and dispose of the assets to which they are contractually entitled.

The quality of the institutions is very important in the assessment of country risk. An institution being understood as a set of incentives that pursue a certain behavior. A sovereign that backs institutions that protect property rights, that protect free market regulations, and that monitor conflict between agents will have a lower country risk.

Default Considerations

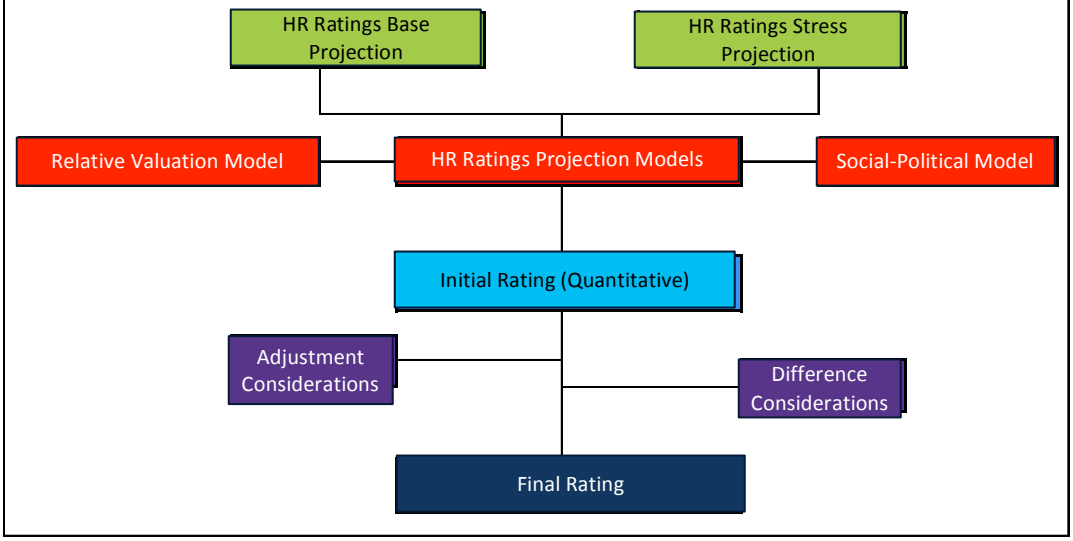
In the HR Ratings methodology, default events are formally incorporated into the adjustment considerations explained below. However, in general terms, we consider the time elapsed since the last default event and the nature and magnitude of the stress factors that caused the event. We also consider the influence that these factors, and the resulting default event, had on the current monetary and fiscal policy.

It's also important to note that we consider as default not only a formal failure to comply with payment obligations, but also a forced restructuring of these obligations, caused by a situation of stress and/or a limited willingness to pay.[2]

Introduction to the Sovereign Rating Process

Our methodology is structured around quantitative and qualitative components. We also consider elements that assess the recent performance of the sovereign through medium and long term projections. The elements considered in our methodology are outlined in Figure 1.

Figure 1: General Sovereign Risk Model



Source: HR Ratings

HR Ratings develops three quantitative models to determine the Initial Rating: 1) the Relative Valuation Model, 2.1) the HR Ratings Base Projection Model, 2.2) the HR Ratings Stress Projection Model, and 3) the Social-Political Model.

[2] The definitions of default are detailed in the HR Ratings "General Methodological Criteria".

The first models are based on different variables representing specific concepts. HR Ratings uses four analytical dimensions to group these concepts: (i) the ability of a sovereign to generate wealth within its territory, (ii) the solidity of its public finances, (iii) the efficiency and credibility of its monetary policy, and finally, (iv) the solidity of its external accounts, which reflect, in part, the perception of the international investor community in terms of the sovereign and its economic performance.

The models have in common the fact that the valuation for the sovereign in question is based on a comparison of parameters drawn, directly or indirectly, from a broad sampling of sovereigns.

The methodology also includes a Social-Political Model (SPM), which consists of an assessment of the sovereign's institutions. Together, all these models and criteria produce the Initial Rating.

The Initial Rating is subject to movements, either up or down, when the effect of the Adjustment Considerations and Difference Considerations is incorporated. Among other things, these considerations are used to determine whether there should be a differentiation between the short and long term ratings, and also between the rating in local currency and in foreign currency. It also includes the impact of other factors not incorporated into the Initial Rating, such as prior defaults, total or partial.

The HR Ratings sovereign ratings are subject to periodical surveillance, as established in the General Methodological Criteria, including monitoring and review.

The Initial Rating

HR Ratings uses a variety of analytical tools to prepare the Initial Rating, so as to appropriately quantify each variable and criterion involved in the study of sovereign risk. This section discusses the three models involved in the process and offers detailed information on the quantification of the metrics used, in order to assign a relative and absolute value to be able to compare the performance of each sovereign in different global contexts. This section contains a detailed analysis of the models, including the Social-Political Model (SPM), and lastly, offers a brief description of their respective advantages.

The Models HR Ratings uses in its quantitative analysis

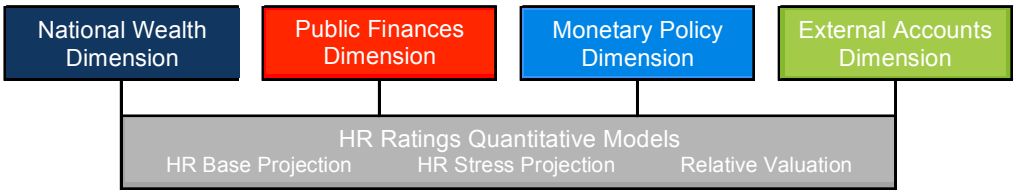
The nature of economic performance requires an analysis that allows for a certain amount of flexibility. Therefore, HR Ratings prepares three models to assess a sovereign under different circumstances. The first model assigns a relative value comparing sovereigns within the same concept using metrics provided by the International Monetary Fund (IMF). Then, the model that uses projections prepared by HR Ratings is described, and the model that introduces adverse conditions and measure the sovereign's ability to react to these conditions, also prepared by HR Ratings.

Lastly, the Social-Political model describes the institutional quality of the sovereign through the governance indicators of the World Bank, and also the "Doing Business" ranking given by the same institution, and the UN human development ranking.

The first models describe the interaction of four concepts, assessed according to different analytical dimensions, which quantify the economic performance of the sovereign in different areas and represent the core structure of the three quantitative models. These constitute a diagnostic in terms of the ability to pay that a sovereign may develop over the coming years.

The short-term liquidity and long-term solvency are considered according to the different metrics analyzed under these analytical dimensions. Therefore, in and of themselves, these can represent the payment and devaluation risks described above. Figure 2 shows the different models and analytical dimensions, followed by a brief description.

Figure 2: Analytical Dimensions



Source: HR Ratings

These analytical dimensions' aid in the assessment of:

- The ability of a country to generate and distribute wealth.
- The prudence of their public finances, considering the amount of tax revenue, the tax structure and the size of the tax base.
- The autonomy, confidence level and efficiency of the Central Bank, and the performance of inflation.
- The country's revenue and terms of exchange on the international market.

Relative Valuation Model

This model considers the values for the concepts presented in the analytical dimensions according to different timeframes starting five years before, then the predictions for the current year, then the forecasts for the next four years. Each timeframe carries a relative weight according to the difference with the forecast for the current year and the direct average is calculated within the grouping after applying the weighting. This draws a concrete result for each metric, which is translated into a final weighting to be used in the model, as shown in Table 1. We use public information from the International Monetary Fund (IMF), to combine forecast and measured information in the same methodology.

Table 1: Relative Valuation Model		
Valuation over time	Year	Weighting
Historic Values (HV)	t-5	μ
	t-4	
	t-3	
	t-2	
Current Values (CV)	t-1	λ
	t	
	t+1	
Future Values (FV)	t+2	ξ
	t+3	
	t+4	
Sum of Weightings		100%

Source: HR Ratings

Equation 1.1 clarifies this concept:

$$v_{i,vr}^{j} = \mu VH_{i,vr}^{j} + \lambda VP_{i,vr}^{j} + \xi VF_{i,vr}^{j} \quad (1.1)$$

Where:

$v_{i,vr}^{j}$: Represents the final value for each variable in the Relative Valuation model (vr) with the corresponding time differential weighting. This is introduced in each of the analytical dimensions. Where $i = \{1, \dots, 9\}$ variables and $j = \{1, \dots, n\}$ countries.

Table 2 offers a hypothetical example for the Economic Growth variable[3]:

Table 2: Hypothetical case, real growth of the GDP						
Time Concepts				Variable and Weightings		
Time	Year	Framework	Weighting by Framework	Real Growth of the GDP (%)	Intra-Framework Average	Total Weightings
t-5 t-4 t-3 t-2	2011 2012 2013 2014	Historic Values	33%	1.3 1.4 1.3 1.5	1.38	0.46
t-1 t t+1	2015 2016 2017	Current Values	33%	1.5 1.6 1.7	1.60	0.53
t+2 t+3 t+4	2018 2019 2020	Future Values	33%	1.7 1.6 1.5	1.60	0.53
Total Time Weighting						1.52

Source: HR Ratings, *hypothetical case*.

[3] Value "t" changes over time.

Once the weighted average is obtained $v_{i,vr}^{j}$, a numeric value (*NV*) between 1 and 19 is then assigned. HR Ratings develops a "curve" for each variable to assign this *NV*, showing the ranges for each value. Additionally, a rating on the HR Ratings scale is given for each variable.

These curves are prepared for each variable within the modes for the quantitative analysis. The values resulting from the evaluation (between 1 and 19) of each variable are reviewed annually to make any adjustments necessary. In the event of changes to the methodology, sovereign ratings will be reviewed according to the General Methodological Criteria.

HR Ratings uses the sampling of countries from the IMF's "World Economic Outlook" (WEO). An analysis is then prepared of the histogram for each variable to assign the ranges corresponding to each *NV* and each rating range.

Table 3 continues the hypothetical exercise, determining $v_{i,vr}^{j} = 1.5\%$ for the economic growth. If $\mu_6 = 1.4\%$ (the lower value of the range) and $\mu_7 = 1.6\%$ (the upper value of the range), then $NV = 13$ and the rating for the economic growth in this model is HR A- (G).

Table 3: Curve and values

Economic Growth	μ_7	=	1.6%
	$v_{i,vr}^{j}$	=	1.5%
	μ_6	=	1.4%
	NV	=	13

Rating	Range Min.	Range Max.	*NV*
HR AAA (G)	μ_1	∞	19
HR AA+ (G)	μ_2	μ_1	18
HR AA (G)	μ_3	μ_2	17
HR AA- (G)	μ_4	μ_3	16
HR A+ (G)	μ_5	μ_4	15
HR A (G)	μ_6	μ_5	14
HR A- (G)	μ_7 $v_{i,vr}^{j}$	μ_6	13
HR BBB+ (G)	μ_8	μ_7	12
HR BBB (G)	μ_9	μ_8	11
HR BBB- (G)	μ_{10}	μ_9	10
HR BB+ (G)	μ_{11}	μ_{10}	9
HR BB (G)	μ_{12}	μ_{11}	8
HR BB- (G)	μ_{13}	μ_{12}	7
HR B+ (G)	μ_{14}	μ_{13}	6
HR B (G)	μ_{15}	μ_{14}	5
HR B- (G)	μ_{16}	μ_{15}	4
HR C+ (G)	μ_{17}	μ_{16}	3
HR C (G)	μ_{18}	μ_{17}	2
HR C- (G)	-∞	μ_{18}	1

Source: HR Ratings, *hypothetical case*.

The *NV* obtained for each variable is then weighted according to Table 4, which also shows how each variable is weighted within its analytic dimension and within the Relative Valuation Model. This does not mean that the variables will maintain this weighting in the other models.

Table 4: Weightings and variables to consider

National Wealth Dimension	Initial Weighting	Final Weighting
GDP Real Growth Rate	α^1	α
Per capita GDP (Purchasing Power Parity)	α^2	
Unemployment Rate	α^3	
Nominal GDP in US$	α^4	
Public Finances Dimension	100%	
Primary Budget Balance (% of the GDP)	β^5	β
Financial Costs (% of the GDP)	β^6	
Net Budgetary Debt (% of the GDP)	β^7	
Monetary Policy Dimension	100%	
Average Inflation LTM		γ
External Accounts Dimension		
Current Account (% of the GDP)		δ
Total		100%

Source: HR Ratings

The weighted average of the *VN's*, according to the parameters in Table 4, produces the rating for the Relative Valuation Model.

HR Ratings Base Projection Model

This model receives the greatest weighting in the Initial Rating for the sovereign. HR Ratings prepares its own projections to model the medium and long term performance of a sovereign. The basis for these projections is obtained from the official information that each country publishes for these metrics and the projections are prepared for the current year and for 7 years into the future. Table 5 shows the time differential valuation for these metrics.

This model is divided into the multiple analytical dimensions already discussed. Each receives a certain weighting, which differs from those in the Relative Valuation Model, as different variables are weighted. Table 6 shows these weightings.

Table 5: HR Ratings Projection Model			
Valuation over time			
Year	Weighting	Year	Weighting
t	η_t	2017	η_t
t+1	η_{t+1}	2018	η_{t+1}
t+2	η_{t+2}	2019	η_{t+2}
t+3	η_{t+3}	2020	η_{t+3}
t+4	η_{t+4}	2021	η_{t+4}
⋮	⋮	2022	η_{t+5}
t+n	η_{t+n}	2023	η_{t+6}
Where:		2024	η_{t+7}
$\eta_t + \eta_{t+1} + \eta_{t+2} + \eta_{t+3} + \eta_{t+4} + \ldots + \eta_{t+n} = 1$		Total	100%

Source: HR Ratings

As in the case of the Relative Valuation Model, a curve method is used here. However, the ranges for each *NV* are not determined according to a sampling; they correspond to the study prepared for each variable and reflect the values that HR Ratings considers appropriate, depending on its forecast for the evolution of the global economy. Once these values have been determined, they remain fixed for the assessment of different sovereigns.

Table 6: Weightings and variables to consider		
National Wealth Dimension	Initial Weighting	Final Weighting
GDP Real Growth Rate	α^1	α
Nominal GDP in US$	α^4	
Public Finances Dimension	100%	
Primary Budget Balance (% of the GDP)	β^5	β
Financial Costs (% of the GDP)	β^6	
Net Budgetary Debt (% of the GDP)	β^7	
Monetary Policy Dimension	100%	
Average Inflation LTM		γ
External Accounts Dimension		
Real Revaluation of the Exchange Rate	δ^9	δ
Current Account (% of the GDP)	δ^{10}	
	100%	
Total		100%

Source: HR Ratings

HR Ratings Stress Projection Model

Using an assessment methodology identical to that used for the HR Ratings Base Projection Model, which implies that the weightings expressed in Table 6 and 8 are the same, HR Ratings develops a scenario based on stress conditions.

This model shows the capacity of a sovereign to respond to adverse environments.

The magnitude of the stress applied to the sovereigns rated is standardized according to the assumptions incorporated into the HR Ratings Base Projection Model.

The ranges for assigning the *VN* will vary due to the different sovereigns having different tools for facing external shocks and other stress conditions.

It's important to note that HR Ratings will periodically review the efficiency of the metrics included (and not included), and their weightings and the minimum and maximum values that determine each rating range for each curve.

Analytical Dimensions

This section describes the analytical dimensions and the variables included in each, detailing the information used and the evaluation models, and their importance in the quantitative analysis.

National Wealth Dimension

The ability of an economy to create, and appropriately distribute, wealth is a relevant factor in its rating. In this dimension, we consider an economy's growth rate, its revenue and employment levels, and also its size within a global context.

The dimension considers the following variables:

- Growth Rate of the Gross Domestic Product, in real terms ($i = 1$).
- Per capita Gross Domestic Product (represented as purchasing power parity) ($i = 2$).
- Unemployment rate ($i = 3$).
- Gross Domestic Product in US$ and in nominal terms ($i = 4$).

Equation 2 shows how these variables perform in the Relative Valuation model:

$$RN^j = \sum_{i=1}^{4} \alpha_i \, v_i^j \quad (2)$$

Where:
α_i: The weighting corresponding to the variable i, when $i = \{1, \dots, 4\}$.

$RN^j \in [0,1]$, and represents the rating corresponding to the National Wealth analytical dimension for country j.

The HR Ratings Base and Stress Projection models exclude the per capita GDP (PPP) and the unemployment rate, therefore their weightings are considered zero.

It's important to emphasize that we information provided by the IMF WEO in the Relative Valuation Model, while the data used in the projection models are prepared by HR Ratings.

(a) Growth Rate of the Gross Domestic Product, in real terms

In general terms, a good real growth rate allows the sovereign to reduce the size of its historic debt against the GDP. Also, and depending on the tax structure and revenue distribution, it increases the possibility the sovereign will have more resources with which to meet its obligations, both in terms of public services and to handle its fiscal balances and debt. Additionally, an economy with good growth rates will attract foreign investment, both direct and portfolio.

This metric, which receives greater weighting in this dimension in the aggregate, is a direct consequence of the structural condition and a reflection of the economic performance. A historic path added to a projection that shows a positive and sustained trend for this variable will reflect the ability of an economy to generate wealth, discounting inflation.

A wide variety of metrics play a key role in this variable, as on being part of the quotient (the denominator), their size represents, in large part, the impact of these metrics on the economy. This would imply that elevated values would tend to refer to healthy economies that are usually rated high.

(b) Per capita Gross Domestic Product (represented as purchasing power parity)

This value represents an estimate of a sovereign's possible fiscal flexibility. This variable offers the advantage of standardizing the size and growth of the population, and indicates an economy's potential capacity to face external shocks.

This metric, as purchasing power parity, translates into a common currency, eliminating the movements for different exchange rates. The basic goods and services are assigned for a reference country and with this, the purchasing power of a population can be estimated at the global level.

This variable is expressed in US dollars to be able to directly compare the metrics between the simple countries.

(c) Unemployment rate

This variable is indicative of an economy's ability to permit its population to contribute its human capital to the production processes and to distribute the wealth generated. Unemployment is defined as the percentage of the population of working age and condition that is inactive or seeking employment at the time of the measure.

Low unemployment rates not only permit greater political maneuverability, but they also indicate a solid economic structure. Higher unemployment levels not only imply lower tax revenue for the government, but also increased spending obligations and thus, put pressure on the public finances.

(d) Gross Domestic Product, in nominal terms

This metric reflects the immediate wealth available to the sovereign to face potential external shocks and debt obligations, which implies a greater tolerance to debt. This variable is considered in US dollars to be able to compare between the sample countries.

The large economies, because of their size within the global economy, may have a certain advantage in attracting foreign investment, with there being no other markets capable of absorbing the capital flows.

Public Finances Dimension

This dimension assesses the sustainability of a sovereign's fiscal policy measuring its tax base and analyzing its tax structure (fiscal flexibility) and its debt position. These variables affect the confidence level of a sovereign in the international market and its improper handling is cause for economic instability.

This dimension considers the following variables:

- Primary Balance as a percentage of the Gross Domestic Product ($i = 5$)
- Financial Costs as a percentage of the Gross Domestic Product ($i = 6$)
- Net debt as a percentage of the Gross Domestic Product ($i = 7$)

Equation 3 shows how these variables perform in this dimension:

$$FP^j = \sum_{i=5}^{7} \beta_i \, v_i^j \quad (3)$$

Where:
β_i: The weighting corresponding to variable i, when $i = \{5,6,7\}$.
$FP^j \in [0,1]$, and represents the rating corresponding to the Public Finances analytical dimension for country j.

The nature of this dimension requires more detailed information than that provided by different international bodies. Therefore, not only will that expressed by the metrics be measured, but also the availability, organization and access to the information provided to the public by the sovereign.

As all the models consider the three metrics in this dimension, the weightings are unchanged.

There may be differences in the measuring of these metrics between the Relative Valuation model and the projection models due to the availability of information. The latter, generally, do not incorporate the public finances for subnational entities. In certain cases, for reasons specific to each sovereign, the methodology may incorporate, for example, subnational debt. This would depend, for example, on the probability of the central government assuming this debt.

(a) Primary Balance as a percentage of the GDP

This balance is estimated with the difference between total revenue and spending for the public sector, excluding financial costs. This is calculated as an adjustment effort for the public finances and is subject to restrictive policies as an integral part of the bailout programs of international bodies.

This variable is essential for measuring the sustainable level of public debt and reflects the handling of the fiscal policy. The prudence of this variable is based on the public debt, therefore high deficit values will not necessarily imply a lack of fiscal sustainability.

(b) Financial Costs as a percentage of the GDP

This variable reflects a sovereign's past performance, and by consequence, beyond its immediate control. Therefore, it is not incorporated into the adjustment plans. In accounting terms, this metric is measured because of previous years. The financial costs take on an important role as they constitute a factor that can significantly limit fiscal flexibility, on being obligations that may be inherited from past administrations.

Additionally, this metric is particularly sensitive to changes in Central Bank reference rates.

The sum of the primary balance and the financial costs is known as the general or financial balance. These metrics are given by the IMF, however the details drawn from the specific information for each sovereign will generate a more accurate value judgment to be able to recreate more probable stress scenarios.

(c) Net Debt as a percentage of the GDP

This metric receives the greatest weighting in the quantitative models and represents, in and of itself, the subject of study in this methodology, particularly in terms of the forecast debt. It takes on different forms and therefore HR Ratings may consider different concepts between sovereigns to measure it. In general, it is based on the debt of the federal/central government. However, HR Ratings may incorporate the debt of state-involved companies when the federal or central government backs this debt, explicitly or implicitly. This consideration will not necessarily extend to financial institutions, due to complications in determining the value of their assets. The measure generally excludes subnational entities unless the federal government backs their obligations.

HR Ratings has observed that certain sovereigns have incorporated a percentage of their contingent liabilities into the measure of their gross debt. Also on occasion, the assets available for pension payments are not recorded in the net debt. Although this accounting

practice may be considered healthy, HR Ratings discounts both concepts from the net debt, unifying the measure between countries.

The trend in this variable is particularly important, as the performance of a sovereign is unlikely to change significantly between periods. This complication results from the difficulty in reaching consensus on the handling of this metric.

Monetary Policy Dimension

This dimension assesses the performance and confidence generated by the central bank, or any institution that controls the monetary policy. These entities control and maintain economic stability through expansive or restrictive policies that seek to regulate the money market, the interest rate and the price levels.

This dimension translates into the flexibility of the institution to control the economic evolution through external shocks.

This dimension considers the following variable:

- Average inflation for the last twelve months ($i = 8$).

Equation 4 shows how this variable performs in the dimension:

$$PM^j = \gamma_8 v_8^j \quad (4)$$

Where:
γ_8: The weighting corresponding to inflation.
$PM^j \in [0,1]$, and represents the rating corresponding to the Monetary Policy analytical dimension for country j.

The monetary institution usually provides these metrics clearly and free of charge. HR Ratings considers the Consumer's Price Index for each sovereign.

(a) Average inflation for the last twelve months

This metric is calculated with the average growth rate for the last twelve observations of the price index. Maintaining the purchasing power of a currency means the real level of a debt will be relatively constant and the risk of devaluation association with the exchange rate will be reduced. The effectiveness in controlling this variable is an indication of the confidence level held by the monetary institutions, as this metric is particularly susceptible to speculation.

High levels of inflation are generally associated with high interest rates further on, including in real terms. This increases the financial cost and, by this mechanism, has a

negative effect on the rating. It must be recognized that high levels of inflation increase the size of the GDP and, by consequence, reduce the relative size of the debt.

Other factors related to the prudence of the monetary policy are considered in the Financial-Economic Criteria.

External Accounts Dimension

The position of a sovereign in the international market implies additional sources of revenue or the ability to sustain internal demand for a certain product. The stability of the exchange terms and the net balance of the participation in this market are factors that alter the wealth of a country and, by consequence, have a direct impact on the assessment of the sovereign risk. Additionally, monitoring the input flows is particularly important due to the accumulation of international reserves.

This model considers the following variables:

- Real Revaluation of the Exchange Rate ($i = 9$)
- Current Account as a Percentage of the Gross Domestic Product ($i = 10$)

Equation 5 shows how these variables perform in this model:

$$CE^j = \sum_{i=9}^{10} \delta_i \, v_i^j \quad (5)$$

Where:
δ_i: The weighting corresponds to variable i, when $i = \{9,10\}$.
$CE^j \in [0,1]$, and represents the rating corresponding to the External Accounts analytical dimension for country j.

In the case of the Relative Valuation model, the weighting corresponding to the real revaluation of the exchange rate is considered zero.

This dimension requires an exhaustive analysis of the current account and the financial account (i.e., capital account) published by each sovereign. Therefore, adherence to the standards set by the IMF for the disclosure of this information will be considered in the analysis of these metrics.

The methodology supposes an economy that has a solid current account will have a greater possibility of accessing the global capital markets to finance its financial deficit and to refinance its debt. This access reduces the possibility of having to restrict the conversion and transfer of resources and therefore plays a key role in a global scale rating.

(a) Real Revaluation of the Exchange Rate

This variable is greatly important in the analysis of country risk, as it shows the cost of paying the debt in foreign currency. The exchange rate is a metric that is exposed to different distortions. An exchange rate policy that does not reflect the market value alters

the exchange terms, which has a direct effect on the current account by modifying the incentives around imports and exports. This allows the sovereign, on manipulating the exchange rate, to devalue the debt as the value of the currencies involved will be affected by this mechanism.

The exchange rate against one of the most used reserve currencies (the US dollar or the Euro) is considered to measure the real revaluation of this variable, as well as the inflation differential between the US and the sovereign subject of the analysis (or as applicable, inflation in the European zone). Appendix 2 to the text "Macroeconomic Scenarios for Mexico: Seeing the Future Reflected in the Past", published July 9, 2012, shows the calculation of this variable for the case of the Mexican peso. Positive levels imply the sovereign currency gains value against the foreign currency, which reduces the real cost of its external financial obligations.

For the specific case of the USA, HR Ratings will use a group of countries with their respective currencies and inflation rates as a point of comparison.

(b) Current Account as a Percentage of the Gross Domestic Product

Although the logic of the HR Ratings methodology emphasizes the ability of a sovereign to receive flows of external capital to finance its debt and its negative flows on its financial balances, the sustainability of these flows depends on the sovereign's current account. The commercial balance subaccount measures an economy's ability to provide its products and services to the world, which represents the basis for its ability to pay the loans the sovereign receives via its capital account. Additionally, the current account measures the cost via interests and dividends from the portfolio and direct investment flows the sovereign receives.

The optimal values for this metric differ between sovereigns, however the current account shows the respective balances for goods and services, the annuity on the factoring services and transfers. Therefore, the format established by the IMF, which details these concepts, is particularly important for measuring this variable.

Inputs for the Initial Rating

Equation 6 shows how the partial rating is obtained for each of the quantitative models discussed so far, which will then determine the Initial Rating.

$$MC_k^j = \alpha RN_k^j + \beta FP_k^j + \gamma PM_k^j + \delta E_k^j \quad (6)$$

Where:
$MC_k^j \in [0,1]$, and represents the rating for model k for country j, where $k = \{vr, hr, hr^e\}$, or {Relative Valuation, HR Ratings Base Projection, HR Ratings Stress Projection}

Later, the quantitative model ratings will be totaled after being multiplied by their weighting, to obtain the Initial Rating for country j. However, the last quantitative model, the Social-Political Model, still needs to be detailed.

Social-Political Model (SPM)

These variables, given their construction and concepts represented, are difficult to measure and are exposed to a subjective appreciation. Therefore, their value relies on their descriptive capacity in the social and political context, which has an important impact on the Initial Rating. External indicators developed by different credible international bodies and formally constructed methodologies are used.

The World Bank, with the help of sophisticated statistical methodology, produces the "*Global Governance Indicators*" which measure:

- Opening and Rendering of Accounts
- Political Stability and Absence of Violence and Terrorism
- Government Effectiveness
- Regulatory Quality
- State of Law
- Corruption Controls

These indicators report a numeric value between -2.5 (weak structure) and 2.5 (strong structure, which allows HR Ratings to conduct a comparative exercise, dividing the distance between the value reported for a country and the minimum value possible, -2.5%, by the maximum and minimum values for the range.

The World Bank's "Doing Business" annual report ranks more than 180 countries according to regulations that favor business activity within the territory of a sovereign.

The United Nations "Human Development Index" includes more than 180 countries, assessing the level of education, life expectancy, the poverty line, gender equality and multidimensional poverty.

To standardize the metric, the ranking given to the sovereign is divided by the number of countries ranked.

These variables consider aspects related to the democratic composition of each country, under the assumption that democratic sovereigns greater stimulate the free market and adequately regulate particularly delicate issues.

Determining the Initial Rating

The Initial Rating is obtained from the rating for each quantitative model. Equation 7 shows how:

$$Initial\ Rating_i = \alpha MVR_i + \beta HR_i^{Base} + \gamma HR_i^{Stress} + \delta MPS_i \qquad (7)$$

Where:

i: Refers to the sovereign rated, $\{\alpha, \beta, \gamma, \delta\}$ are the weightings for the Relative Valuation, HR Ratings base projection, HR Ratings stress projection and Social-Political models, respectively.

Determining the Final Rating

The Initial Rating is the basis for the Final Rating. The result from the HR Ratings qualitative analysis determines the difference. There are various factors that cannot be incorporated into the quantitative analysis. Also, similar computable values can have different implications, according to the characteristics of the sovereign. This section details the tools HR Ratings uses to incorporate these factors.

Adjustment Considerations

There are factors that are specific to each sovereign that, in the opinion of HR Ratings, cannot be incorporated into the quantitative models of this methodology. These factors or considerations are qualitative and can reward or punish the initial rating with "notches." This series of considerations refers to factors assessed for each sovereign and which may alter the Initial Rating.

A description of some of these variables is provided following:

Demographic Structure and Contingent Liabilities:

- Structural problems and population trends can be identified through low rates of labor activity which, as contingent liabilities, may be harmful to the fiscal structure of a sovereign, directly affecting the expected value for the sustainability of the debt

- The population dynamic may suggest important future spending in health and welfare systems, which may result in the active population being insufficient to cover this spending and other obligations.

Revenue Distribution:

- The inadequate distribution of revenue, reflected in a cumulative revenue curve by percentiles, constitutes a factor of political instability and palpable evidence of severe structural problems, which can affect a stable growth trend. Therefore, a high differential between this curve (Lorenz) and the 45º curve (Gini Coefficient) will result in a penalization of the rating generated with these metrics.

Fiscal Sustainability:

- HR Ratings uses certain mathematical tools to estimate the value necessary for the Primary balance to maintain a stable debt level, in terms of the GDP. This model provides dynamic tools to assess the fiscal prudence of the sovereign and the magnitude of the adjustment necessary to achieve equilibrium in the debt to GDP ratio.

Sub-National Debt:

- Consideration is given to the debt of various municipalities, states, regions, or other forms of division within a sovereign's territory, and the willingness of the sovereign to answer for this.

Informal Economy

- The composition of the tax base is another relevant factor; a broad informal labor market limits a sovereign's capacity to collect taxes, causing a dependence on certain sectors.

Real Reference Rate

- The numeric valuation of this variable includes qualitative considerations that measure not only the confidence in the central bank, but also its flexibility; this is determined through an analysis of comparative statics regarding this variable. Therefore, the rating associated with this metric reflects the capacity of this institution to generate a substitution effect between consumption and saving, according to the needs of the economy at any particular time.

Autonomy of the Central Bank or the Monetary Institution:

- Countries where this institution is autonomous tend to operate with higher levels of public trust, consequently their policies tend to be more efficient.

Solidity of the Bank System

- As has been seen in countries like Spain and Ireland, the solidity of the bank system has profound implications on the sovereign debt. The regulatory regimen, the capitalization level, and its concentration are relevant factors for the country risk.

- A healthy capital market is another factor that supports monetary flexibility, as these markets have multiple mechanisms for transmitting monetary policies through the economy.

Growth of the Monetary Base:

- This variable captures the performance of the monetary institution; an accelerated growth of the monetary base tends to generate an inflationary trend and devalue the debt. This effect changes depending on how much the local currency is used on the international market. In the case of reserve currencies, a printing, whose purpose is to fund financial obligations, may be appropriately absorbed by other monetary institutions as reserve, therefore an increase in prices may only be slightly felt, at least in the short and medium term.

- Excess reserves held by the bank system are particularly important, as when these are used they may cause and inflationary and devaluating effect.

Direct Foreign Investment:

- The influx of revenue reflects the degree of confidence that international investors have on the future performance of an economy. It also reflects the level of protection a sovereign offers these investments.

International Portfolio Investment:

- This metric accumulates the influxes of revenue into a country registered in its capital or financial account. It reflects investor confidence in a sovereign and represents, in part, a change in the amount of the international reserves.

International Reserves:

- These reserves represent an important part of a sovereign's liquidity in external terms. This amount allows the government to resist financial crises where the local currency loses value, and on being an indicator of an economy's strength, it encourages greater direct and portfolio foreign investment; creating a virtuous circle.

Flexible Lines of Credit:

- These represent a similar phenomenon to that of the international reserves, in addition to providing empirical evidence of the confidence that certain international organizations or other sovereigns may have in the future performance of an economy.

Capacity to React to External Shocks:

- The 2008-2009 global financial crisis revealed the capacity of different sovereigns to react to different crises. HR Ratings considers this lesson a relevant factor in the country and sovereign risk analysis. Therefore, not only this crisis but any crisis reported must be considered and the capacity and form in which the sovereign has reverted the negative trends.

Reserve Currency

- Applies to privileged sovereigns whose currencies are considered reserve by other countries, international financial institutions, and other non-resident investors or entities. This factor is relevant as it allows the sovereign to take on ambitious monetary expansion programs without facing the conventional problems of inflation or debt devaluation.

These factors also include any that is infrequent and which may be observed in one sovereign only. A negative example would be a punishment of the initial rating for a record of recent defaults. An example of a positive factor would reward a sovereign that has a certain international prestige allowing the sovereign to place debt on the international markets.

Adjustment Considerations for Difference

These considerations refer to a dissimilarity between the sovereign's rating in local and in foreign currency, and between the short and long term rating. When this is the case, the rating will usually vary between one and two notches, depending on the impact estimated by HR Ratings.

The short-term risk, resulting from the immediate liquidity of the sovereign, and the long term risk, determined by the fiscal solvency, represent the principal difference factors in the methodology.

The risk of devaluation of the debt through inflation or the absence of different regulations on conversion or transfer between currencies can justify a differentiation between the rating in local and in foreign currency.

Sovereign Bond Rating

Generally, all obligations issued or backed, explicitly or implicitly, by the Federal/Central Government will be given the final rating assigned to Federal/Central Government applying this methodology. However, an offering may have unique characteristics that will allow HR Ratings to assign a level of risk that is different from the sovereign, as an adjustment consideration.

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Appendix 1

Rating	Ability to Pay	Description
HR AAA (G)	Extremely Strong	Excellent fiscal prudence, efficient, autonomous, and trusted monetary institution. Stable and strong economic growth trend supported by public policy. Strong external liquidity. Diversified sources of revenue. Sustainable debt burden. Strong and stable local financial system. The highest capacity to support external shocks.
HR AA+ (G) HR AA (G) HR AA- (G)	Very Strong	Clear fiscal prudence. Autonomous and trusted monetary institution. Stable economic growth trend supported by public policy. Strong external liquidity. Relatively diversified sources of revenue. Sustainable debt burden. Stable local financial system. High capacity to support external shocks.
HR A+ (G) HR A (G) HR A- (G)	Strong	Fiscal prudence. Autonomous and trusted monetary institution. Stable and strong economic growth trend. Sufficient external liquidity. Relatively diversified sources of revenue. Sustainable debt burden. Stable financial system. Certain capacity to support external shocks.
HR BBB+ (G) HR BBB (G) HR BBB- (G)	Adequate	Moderate fiscal policy. Autonomous monetary institution. Stable economic growth trend. Certain external liquidity. Non-diversified sources of revenue. Adequate handling of debt. Consolidated local financial system. Certain capacity to support external shocks.
HR BB+ (G) HR BB (G) HR BB- (G)	Uncertainty in adverse circumstances, less vulnerability	Rudimentary fiscal policy. Monetary institution with certain autonomy. Unstable economic growth trends. Certain external liquidity. Sparse sources of revenue and not diversified. Unsustainable level of debt in the long term. Consolidated and weak local financial system. Certain capacity to support external shocks.
HR B+ (G) HR B (G) HR B- (G)	Greater vulnerability in adverse circumstances	Imprudent fiscal policy. Monetary institution not autonomous. Unstable and negative economic growth trend. Low external liquidity. Sparse sources of revenue and not diversified. Unsustainable level of debt. Weak local financial system. Low capacity to support external shocks. History of default under similar circumstances.
HR C+ (G) HR C (G) HR C- (G)	Possibility of Default	Lowest fiscal prudence. Monetary institution not autonomous or inefficient. Negative economic growth trend. Low external liquidity. Sparse sources of revenue and not diversified. Debt crisis. Weak local financial system. Null capacity to support external shocks. Recent history of default under similar circumstances.
HR D (G)	Default	The sovereign in question has fallen into Technical or Total Default.

* The purpose of the conditions explained in this table is to clarify general questions only for the different degrees of rating, therefore the particularities of each sovereign are excluded.
Source: HR Ratings

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