

Muller, Philippe; Bourque, Jérôme

Working Paper

Methodology for assigning credit ratings to sovereigns

Bank of Canada Staff Discussion Paper, No. 2017-7

Provided in Cooperation with:

Bank of Canada, Ottawa

Suggested Citation: Muller, Philippe; Bourque, Jérôme (2017) : Methodology for assigning credit ratings to sovereigns, Bank of Canada Staff Discussion Paper, No. 2017-7, Bank of Canada, Ottawa, <https://doi.org/10.34989/sdp-2017-7>

This Version is available at:

<https://hdl.handle.net/10419/200477>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Staff Discussion Paper/Document d'analyse du personnel 2017-7

Methodology for Assigning Credit Ratings to Sovereigns



by Philippe Muller and Jérôme Bourque

Bank of Canada staff discussion papers are completed staff research studies on a wide variety of subjects relevant to central bank policy, produced independently from the Bank's Governing Council. This research may support or challenge prevailing policy orthodoxy. Therefore, the views expressed in this paper are solely those of the authors and may differ from official Bank of Canada views. No responsibility for them should be attributed to the Bank.

Bank of Canada Staff Discussion Paper 2017-7

May 2017

Methodology for Assigning Credit Ratings to Sovereigns

by

Philippe Muller and Jérôme Bourque

Funds Management and Banking Department
Bank of Canada
Ottawa, Ontario, Canada K1A 0G9
pmuller@bankofcanada.ca
jeromebourque@bankofcanada.ca

Acknowledgements

The authors would like to thank, without implicating, Mark Carney, former Governor of the Bank of Canada, for making possible the fascinating project of developing credit risk assessment capabilities within the Bank of Canada. We are also grateful for the guidance, questions, comments and suggestions from David T. Beers, James McCormack, Norman Yeung, and Nourredine Lafhel, Jean-Sébastien Nadeau, previously of the Bank of Canada, and Ron Morrow, Grahame Johnson, Denise Côté, members of the joint Department of Finance Canada and Bank of Canada Credit Rating Committee and members of the Credit Rating Assessment Group of the Financial Risk Office.

Abstract

The investment of foreign exchange reserves or other asset portfolios requires an assessment of the credit quality of investment counterparties. Traditionally, foreign exchange reserve and asset managers have relied on credit rating agencies (CRAs) as the main source for credit assessments. The Financial Stability Board issued principles to reduce reliance on CRA ratings in standards, laws and regulations, in support of financial stability. Moreover, best practices in the asset management industry suggest that investors should understand the credit risks they are exposed to and, more broadly, that internal credit assessments be relied upon to inform investment decisions. In support of efforts by market participants to establish stronger internal credit assessment practices, as well as to solicit feedback, this paper provides a detailed technical description of the methodology developed to assign internal credit ratings to sovereigns, using publicly available data only. This methodology proposes three key innovations: (i) a quantitative approach to assess political risks, (ii) a framework to assess the government's potential contingent liabilities related to the banking sector, and (iii) a framework to determine the presence of asset price imbalances in the country. The methodology presented relies on fundamental credit analysis that produces a forward-looking and “through-the-cycle” assessment of the investment entity's capacity and willingness to pay its financial obligations, resulting in an opinion on the relative credit standing or likelihood of default. The methodology presented is currently used to assess eligibility and inform investment decisions in the management of Canada's foreign exchange reserves. The methodology is a key component of the joint Bank of Canada and Department of Finance Canada initiative to develop internal credit assessment capabilities.

Bank topics: Credit risk management; Foreign reserves management

JEL codes: G24; G28; G32; F31

Résumé

Le placement des réserves de change ou d'autres portefeuilles d'actifs nécessite au préalable une évaluation de la qualité du crédit des contreparties aux opérations de placement. En règle générale, les gestionnaires d'actifs et de réserves de change recourent aux cotes de crédit attribuées par les agences de notation. Pour soutenir la stabilité financière, le Conseil de stabilité financière a publié des principes visant à réduire le recours systématique aux cotes des agences dans les normes, les lois et les règlements. En outre, les pratiques exemplaires du secteur de la gestion des actifs sous-entendent que les

investisseurs comprennent les risques de crédit auxquels ils sont exposés et, de manière générale, recourent aux évaluations internes du crédit pour éclairer les décisions de placement. Pour appuyer les efforts entrepris par les participants au marché en vue d'établir des pratiques internes d'évaluation du crédit plus solides et de recueillir des commentaires, le présent document d'analyse fournit une description technique détaillée d'une méthodologie conçue pour attribuer une cote de crédit interne aux émetteurs souverains fondée entièrement sur des données publiques. Cette méthodologie propose trois grandes innovations : 1) une approche quantitative pour soupeser les risques politiques, 2) un cadre pour évaluer les passifs éventuels des États liés au secteur bancaire et 3) un cadre pour faire ressortir les déséquilibres de prix des actifs dans un pays donné. La méthodologie exposée repose sur une analyse fondamentale du crédit qui génère une évaluation prospective « sur l'intégralité du cycle » de la capacité et de la volonté des entités de placement de s'acquitter de leurs obligations financières, ce qui se traduit par une opinion sur la solvabilité relative ou la probabilité de défaillance de ces entités. Elle est actuellement utilisée pour déterminer l'admissibilité et éclairer les décisions de placement dans le cadre de la gestion des réserves de change du Canada. La méthodologie est un élément essentiel de l'initiative conjointe de la Banque du Canada et du ministère des Finances ayant pour objet d'établir des capacités d'évaluation interne du crédit.

Sujets : Gestion du risque de crédit ; Gestion des réserves de change

Codes JEL : G24 ; G28 ; G32 ; F31

1. Introduction

This paper provides a detailed technical description of a methodology designed to assign internal credit ratings to sovereigns using only publicly available data. Our sovereign rating methodology relies on fundamental credit analysis that produces a forward-looking and “through-the-cycle” assessment of a sovereign’s capacity and willingness to pay its financial obligations, resulting in an opinion on the relative credit standing or likelihood of default. The paper focuses on the components of the methodology that are new to the science of credit risk assessment for sovereigns, and includes components that have been borrowed from the existing literature. The authors intend for this paper to support efforts by reserve managers and other investors to go beyond mechanistic reliance on credit rating agency (CRA) ratings and instead establish or strengthen internal credit assessment practices. The methodology presented can be used by credit risk practitioners to assess the relative credit quality of a sovereign. Moreover, this framework is flexible enough to accommodate modifications that cater to specific needs.

The investment of foreign exchange reserves or other asset portfolios requires an assessment of the credit quality of investment counterparties. Most portfolios are managed subject to capital preservation, liquidity and return objectives. The capital preservation objective—and to a lesser extent the liquidity objective—often includes a definition in terms of the credit quality of investment counterparties. Investment guidelines for portfolios would typically include a requirement that investment counterparties meet or surpass a minimum level of credit risk. In addition, investment guidelines could also limit portfolio exposures to individual investment counterparties and/or a category of counterparties on the basis of their credit rating. In the case of Canada’s foreign exchange reserves, the [*Statement of Investment Policy for the Government of Canada*](#) (SIP) stipulates that investment counterparties must meet or surpass a credit risk rating of A-. A source for credit assessments is thus required to determine eligibility and possibly to set exposure limits to investment counterparties.

Traditionally, foreign exchange reserve and asset managers have relied on CRAs as the source for credit assessments. Market participants have also relied on CRAs as their source for credit assessments, for a number of reasons. The use of CRA ratings provides an efficient, widely recognized, transparent and long-standing measure of relative credit risk. For public institutions and regulators, the transparency of the CRA ratings facilitates communication of investment guidelines and adherence to these. For instance, the availability and transparency of CRA ratings allows foreign exchange reserve managers to communicate independent, third-party credit assessments to the public.

More recently, best practices have evolved and have driven market participants to develop and rely more on internal credit assessments. In October 2010, the Financial Stability Board issued the [*Principles for Reducing Reliance on CRA Ratings*](#). These principles were subsequently endorsed by the G20 in November 2010. The aim of these principles is to reduce reliance on CRA ratings in standards, laws and regulations and lessen the threats to financial stability from the herding and cliff effects that could arise from CRA rating thresholds being strictly integrated into laws, regulations and market practices. Specifically, for central banks and managers of foreign exchange reserves, the principles state that, “Central banks should reach their own credit judgements on the financial instruments that they will

accept in market operations, both as collateral and as outright purchases,” and that, “Central bank policies should avoid mechanistic approaches that could lead to unnecessarily abrupt and large changes in the eligibility of financial instruments.” (Principle III.1., p.5) Moreover, best practices in the asset management industry suggest that investors should understand the credit risks they are exposed to and, more broadly, that internal credit assessments are relied upon to inform investment decisions. Indeed, as stewards of public funds, both the Bank of Canada and Department of Finance Canada have a responsibility to understand their credit risk exposures.

In 2013, the Bank of Canada established the Credit Rating Assessment Group within its Financial Risk Office. The purpose of the group is to evaluate the credit (default) risks of assets and other financial exposures of both the Bank and of that the Bank manages on behalf of the Government of Canada. The group supports the Credit Rating Committee, composed of representatives of the Bank and the Department of Finance Canada. The Committee is responsible for assigning ratings to the trading and investment counterparties of the Exchange Fund Account and the Bank of Canada. Internally determined ratings are used to set eligibility requirements and credit limits as part of the Bank’s and government’s risk-management policy. These internal ratings have replaced mechanistic use of those provided by the following CRAs: DBRS, Fitch Ratings, Moody’s and Standard & Poor’s (S&P).

The Credit Rating Assessment Group has developed internal rating methodologies built upon credit risk practitioners’ best practices. In addition to the internal sovereign methodology, the Credit Rating Assessment Group has developed methodologies for rating multilateral development banks (MDBs) and government-related entities.¹ The development of our internal methodology followed the Bank’s general process and began with the creation of templates based on provisional rating methodologies. These drew from the work of other credit risk practitioners and relevant academic research. As expertise and knowledge grew, the Credit Rating Assessment Group improved its internal methodologies, retained components from provisional templates that were deemed to align with the objectives of the internal methodology, and bolstered its models with new components and measures.

For instance, our internal sovereign methodology proposes an innovative way to evaluate political risks, as well as a simple method to assess a sovereign’s potential contingent liabilities related to the banking sector, based on publicly available data. In addition, our methodology contains a framework for determining the potential presence of credit or asset price imbalances in the country being assessed.

The body of this paper is divided into three main sections. Section 2 describes the key constructs used in the development of our internal methodologies. These constructs include the need for a solid governance structure, ratings that are applicable to existing credit risk management policies, and high-quality ratings based on public information that remain internal to the Bank and Department of Finance

¹ Government-related entities (GREs) are primarily defined by their roles and functions related to the provision of critical public services, which makes them more prone to receive government support in the event of financial difficulty. GREs generally include administrative bodies, agencies and public corporations formed, nationalized or controlled by a government. However, some entities with little or no link to government may also be considered GREs, based on their systemic importance to the economy or functioning of government.

Canada. Section 3 presents the framework of the methodology, including a brief description of each of the five components of the model and an explanation of how individual scores assigned to each component are combined to obtain an opinion on the relative credit standing or likelihood of default of the sovereign being assessed. Section 4 provides a detailed description of each component of the methodology, including the rationale, theory and empirical analysis supporting each risk factor as well as how each was calibrated. The paper concludes with a brief discussion of potential future research and encourages feedback from other practitioners on the applicability of the methodology described.

2. Fundamental Constructs Used in the Development of the Methodology

This section describes the key constructs used in the development of our internal methodologies. Readers interested in only the technical aspects of the sovereign methodology can proceed directly to the next three sections.

The framework used in this joint Department of Finance Canada and Bank of Canada initiative rests on the belief that it would be beneficial to develop internal credit assessment capabilities, and that these are used to assign internal credit ratings that would replace or complement those from CRAs and, more broadly, to apply insight gained in the conduct of credit assessments to support the investment-decision process used to manage Canada's foreign exchange reserves.²

The overall approach to develop the methodology is based on a number of key fundamental constructs. These include the need to: (i) rely on a governance process that ensures that ratings are influenced only by considerations related to the credit quality of the entity being assessed, (ii) generate credit ratings that are applicable to existing credit risk management policies, and (iii) establish a high-quality, transparent and consistent assessment process based on publicly available data. These ratings remain internal to the Bank of Canada and Department of Finance Canada.

2.1. Ratings Supported by Robust Governance Framework

The Credit Rating Assessment Group and the internal credit risk assessment framework aim to ensure that credit risk assessments are influenced only by considerations related to the credit quality of the entity being assessed.

As noted earlier, the Credit Rating Assessment Group is part of the Bank's Financial Risk Office, which is independent from the front office operations from an organizational perspective.³ The Credit Rating Assessment Group supports the operationally independent Credit Rating Committee that assigns ratings. The Credit Rating Committee is composed of representatives from across the Bank and the Department of Finance Canada, and is co-chaired by the Director of the Financial Risk Office and an

² See Bank of Canada (2013, Box 2) for a more detailed description of the joint Department of Finance Canada and Bank of Canada initiative to develop internal credit risk assessment capabilities.

³ The term "front office" is used here to describe the team(s) directly involved in the execution or implementation of investment and funding decisions.

executive member of the Bank.⁴ A key consideration for Credit Rating Committee membership is to ensure that representation be balanced and that no single business line (including from the Financial Risk Office or Credit Rating Assessment Group) form the majority. Another consideration is to ensure the independence of those assigning credit ratings from those making investment decisions.

A governance process is also in place to ensure the methodology continues to produce appropriate ratings. The internal ratings assigned by the Credit Rating Committee are reviewed annually by a risk committee to assess whether the ratings have met their objectives. In addition, the internal rating methodologies are recalibrated on an annual basis and undergo a fundamental review triennially.

From a responsibility and accountability perspective, the Credit Rating Assessment Group shares ownership of the sovereign rating methodology and is the single owner of the recommendations the group makes to the Credit Rating Committee. Similarly, though the sovereign methodology is formally approved by senior management, the Credit Rating Committee also shares ownership for the methodology and is the single owner for the internal ratings it assigns. Accountability for the quality of the sovereign methodology and the internal ratings generated by its use is seen as a key fundamental construct in support of the initiative to develop internal credit risk assessment capabilities. Indeed, accountability for any use of the internal credit ratings assigned on the basis of this methodology is internal to the Bank of Canada and the Department of Finance Canada.⁵

The internal ratings generated on the basis of the sovereign methodology presented in the next sections are intended to be used for internal credit risk management purposes only. The objective is to generate ratings that can inform investment decisions and replace CRA opinions. Internally determined ratings are thus geared to generate benefits for the internal investment decision-making process and global financial stability. Publishing the ratings could be counter to the objectives of the G20 and FSB principles to encourage investors to conduct independent credit risk assessments, rather than relying on opinions from CRAs, the Credit Rating Committee or other external sources.

2.2. Ratings Applicable to Credit Risk Policies

The aim of this initiative is to replace CRA ratings with comparable internal opinions supported by in-house research. The methodology developed thus relies on credit risk assessment approaches consistent with those of CRAs.

The methodology produces a rating that can be used as a source of credit assessment for determining eligibility and setting limits according to existing credit risk guidelines. In order to replace the credit assessments from CRAs with internal ratings, without requiring other changes to credit risk policies, the aim of the methodology is to assess a debt issuer's capacity and willingness to pay its financial obligations, resulting in an opinion on an issuer's relative credit standing or likelihood of default. The methodology uses a rating scale and symbols similar to those used by S&P and Fitch Ratings, and a

⁴ See listing of the Bank's [Executive Leadership and Senior Management](#).

⁵ Previously, when the source for credit risk assessments was CRAs, the responsibility and accountability for the credit ratings had effectively been outsourced to the CRAs.

horizon of three to five years. By design, the developed methodology produces a through-the-cycle rating using both historical and forecast data, thereby encapsulating a full economic cycle. As such, the methodology's sensitivity to daily market fluctuations and other high-frequency data releases is fairly limited.

The methodology presented in this paper assesses the default risk, or the relative ranking of an issuer's probability of default, which is a function of both the intrinsic financial strength of the sovereign and the willingness of the government to appropriate the required resources to meet its financial commitments. The definition of default includes both payment default, where the issuer fails to make principal and/or interest payments on the due date or within a grace period, and distressed exchanges, where the issuer offers new debt for old on terms (e.g., coupon maturity) less favourable than those for the original instrument.

2.3. Ratings of the Highest Quality

The methodology developed to assign an internal credit rating to sovereigns relies on the incorporation of fundamental credit analysis that is forward-looking and considers both qualitative and quantitative factors. The factors used to assess the credit quality of a debt issuer are empirically based, with inferences about debtor behaviour based on data derived from past credit cycles. In the development of the methodology, we relied on fundamental credit analysis based on the belief that, resources permitting, fundamental credit analysis is usually preferred to market-based measures, since qualitative and quantitative factors can be combined to make sound credit judgments.⁶

The aim is to produce ratings that are not affected, or perceived to be affected, by considerations other than those related to credit quality over a three- to five-year horizon. There is an underlying belief that internal ratings are more timely than those of rating agencies, and that this is feasible, as the internal ratings process is not subject to some of the constraints faced by CRAs. The ratings generated reflect the most recently available information. Furthermore, internal ratings are not affected by the inherent conflict with the CRA business model, whereby issuers (generally) pay to have a CRA assign ratings to their debt securities. Similarly, internal ratings are not subject to the challenge posed by the publication of credit rating decisions.⁷ In addition, CRAs may be influenced by regulatory and political considerations. All of these considerations could influence the timing, independence and objectivity of the rating actions.⁸

The development of the methodologies began with the creation of templates based on provisional rating methodologies that drew from the work of other credit risk practitioners and relevant research. Using macroeconomic scenarios and credit analysis provided by the Credit Rating Assessment Group, the Credit Rating Committee began assigning (provisional) internal ratings to the sovereign, MDB and

⁶ We define fundamental credit analysis as the analysis of a debt issuer's capacity and willingness to pay its financial obligations, resulting in an opinion of relative credit standing or likelihood of default. Fundamental credit analysis is also forward-looking, considers both qualitative and quantitative factors and is empirically based.

⁷ Recall from section 2.1 that internal ratings are not disclosed publicly.

⁸ Regulations imposed on CRAs have, for instance, resulted in limiting the timing at which CRAs can take potential rating actions on entities being reviewed to only predetermined days per year.

other issuers that make up the Exchange Fund Account portfolio. This phased approach was adopted to gain experience in applying rating methodologies and scoring templates. This in turn strengthened the robustness of the final rating methodologies and templates. Indeed, provisional internal ratings were used alongside those of CRAs for at least a year, while investment guidelines continued to officially rely on CRA opinions. As expertise and experience grew, the Credit Rating Assessment Group enhanced its credit rating methodologies, modified template components to ensure they align with the internal methodology objectives, and bolstered models with new components and measures to assign various scores to risk factors. Over time, the methodologies evolved, in many cases maintaining mostly the shell and structure of that from publicly available credit rating methodologies for sovereigns.

To attain the objective of generating ratings that are both high-quality and timely, the internal ratings were back-tested to ensure they would yield results that were comparable with those of CRAs, across a range of issuers of varying credit quality and a number of credit cycles. Conducting this back-testing exercise on the internally generated ratings allowed the Credit Rating Assessment Group to assess whether the methodology properly captured the credit quality of different issuers at a given point in time. The back-testing also determined that the ratings generated through the new methodology evolved in response to changes in risk factors and with changes in the CRA credit ratings.

Lastly, as outlined in section 2.1, a governance process is in place to ensure that the sovereign rating methodology continues to meet the desired objectives.

2.4. Consistency, Transparency and Reliance on Public Data

Another construct is to generate internal ratings that can be consistently produced by a different analyst using the same information. A methodology was therefore sought that is robust and that relies as much as possible on quantifiable metrics to guide forward-looking assessments of credit risk of sovereigns. To the greatest extent possible, quantitative metrics are used and, as required, supplemented with qualitative judgments.

The objective of producing ratings of the highest quality also suggested that the methodologies developed be transparent and published, so as to benefit from comments and suggestions from specialists advancing the frontier of credit risk assessments methodologies.

Another consideration is to generate ratings that could be explained and justified on the basis of public data only. Indeed, it is important to avoid the perception that internally generated ratings result from insight obtained by staff in the course of their work at the Bank of Canada or the Department of Finance Canada.⁹

⁹ For certain entities assessed, individuals at the Bank of Canada or the Department of Finance Canada may come across non-public information relevant to the credit quality of such issuers. Insights obtained by staff are, however, used to develop and improve the methodology.

3. Key Risk Factors and Overall Rating Framework

Sovereigns have several unique characteristics that affect their creditworthiness. From a credit analysis perspective, these characteristics can present various challenges when trying to determine a sovereign's credit rating. Sovereigns are the highest authority of a country and have powers that no other entities have, including the ability to raise taxes, create laws, declare war, sign treaties with other sovereigns, and control the currency. Furthermore, sovereign issuers have extremely long lifespans and rarely cease to exist, except in exceptional circumstances.

From a creditor's perspective, the ability to collect debt owed by a sovereign relies to some extent on the goodwill of the sovereign for repayment. Since sovereigns are the highest authority of a country, debt holders have limited recourses to force a sovereign government to honour its financial obligations if or when it chooses not to. An analysis of sovereign creditworthiness must therefore take into account not only the sovereign's ability to repay but also its willingness to do so. This approach is in line with current credit rating practices.

Also keeping with common practice among credit rating practitioners, the sovereign rating model we developed provides an assessment of the credit quality for all countries. This approach raises challenges in developing a methodology that reflects the different levels of income and wealth of a country, the sources of a country's wealth and income, the political and legal systems, and the monetary policy implemented by the country's central bank or monetary authority. Furthermore, the availability of data to assess such a wide and diverse group of countries can also often be challenging.

A literature review of existing sovereign methodologies published by practitioners shows that the risk factors assessed are broadly similar from one practitioner to another. The risk factors in our methodology include the sovereign's institutional strength and political stability, economic performance including the presence of credit and asset price imbalances, external vulnerabilities and competitiveness, the general government's overall fiscal position including potential contingent liabilities, and monetary policy flexibility. These factors have also been identified in the literature on sovereign debt crisis. The indicators we use and the thresholds to determine the risk categories are inspired by the published sovereign rating methodologies of credit rating practitioners and the research of various organizations, such as the European Central Bank. We also relied on internal expertise to develop risk indicators.

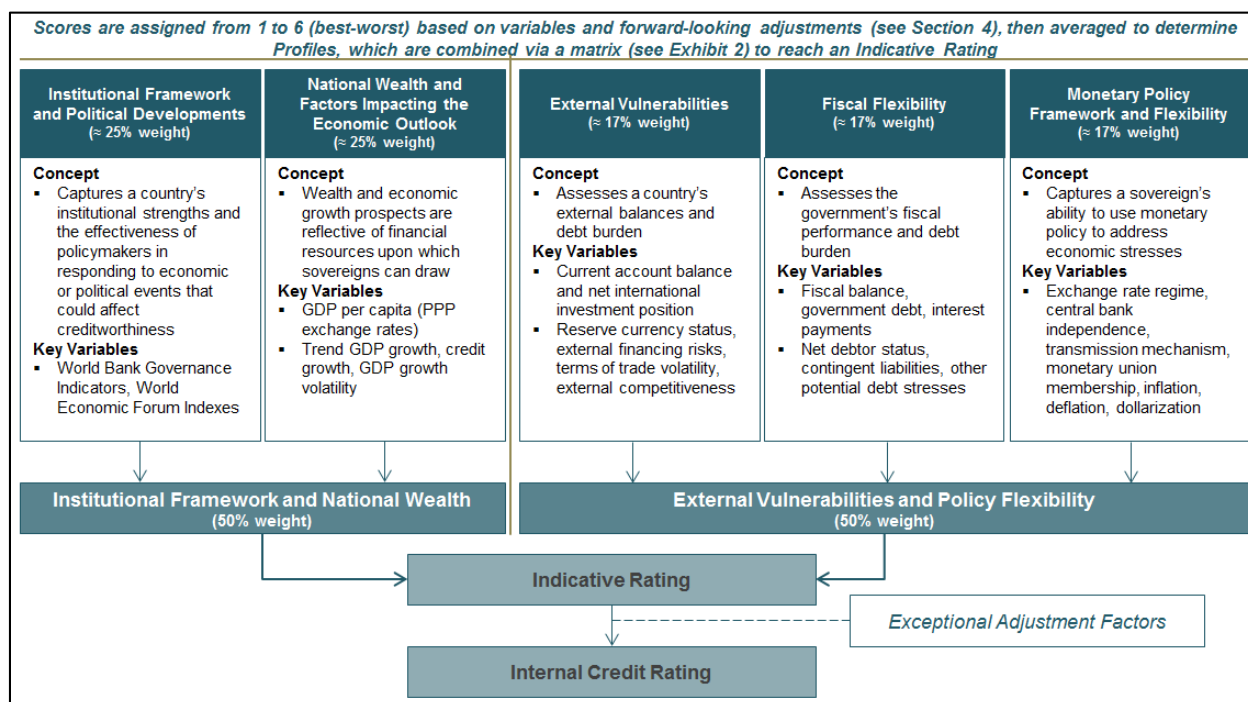
The shell and structure of our methodology presented in this document is largely built upon the methodologies of CRAs.

Since inception, our models have gone through a series of annual calibration exercises that aimed to maintain the robustness of scoring thresholds and improve the existing methodology. This paper presents the current version of the models; as the models continue to evolve over time, the authors intend to update this paper.

3.1. Key Risk Factors

The five key risk factors identified in this document are broadly similar to those used by S&P. As presented in Exhibit 1, specific qualitative and quantitative indicators are identified to measure each sub-factor. These specific indicators are a combination of those used in various practitioners' methodologies, those found in academic literature, and those proposed by the authors.¹⁰ The scoring category for each main factor and sub-factor ranges from 1, the highest possible score, to a maximum of 6, the weakest category.

Exhibit 1: Overview of Sovereign Rating Methodology



The first key risk factor, **Institutional Framework and Political Developments** score, captures a country's¹¹ institutional features and the effectiveness of policymakers in responding to economic or political events that could affect creditworthiness. This factor assesses, from a political perspective, both the sovereign's ability *and* willingness to meet its financial obligations. The quality of a country's institutions and the ability and willingness of policymakers to mobilize the funds necessary to repay its financial obligations while maintaining social cohesiveness plays an important part in determining the **Institutional Framework and Political Developments** score. Based on the research of rating agencies

¹⁰ The following papers, not mentioned elsewhere in this publication, also informed the development or subsequent refinement of the methodology described herein: Baas (2010), Chalk and Hemming (2000), Correa and Sapriza (2014), Hemming and Petrie (2000), Reinhart (2002), Reinhart, Rogoff and Savastano (2003), Cavanaugh, Chambers and McGraw (2013), and Lundberg et al. (2011).

¹¹ Throughout this document, we make the distinction between "sovereign risk" and "country risk." The former refers to the risk of a sovereign government defaulting on its contractual financial obligations, such as issued and guaranteed debt. Country risk comprises a broader set of risks related to doing business in the country, which encompasses all the various factors that would impact public and private borrowers' ability to pay and to operate.

and other credit rating practitioners, we propose an **Institutional Framework and Political Developments** model based on four sub-factors that provide an indication of a country's institutional and political creditworthiness: *Legal Framework*, *Policy Effectiveness*, *Political Stability*, and the incidence and likelihood of *Conflict*. One of the key innovations introduced in this sovereign methodology is the calculation of each of these sub-factors using quantitative data from external sources.¹²

The second key risk factor is the **National Wealth and Factors Impacting the Economic Outlook** score. It captures the wealth and economic growth prospects of a country, which are reflective of the financial resources upon which sovereigns can draw. Wealthy, diversified and flexible economies typically provide a sovereign with a greater potential tax base and therefore a more stable and predictable source of income. Economic growth and its volatility are other important considerations of sovereign creditworthiness. The ability of economies to generate and sustain growth supports debt servicing and the debt dynamics of the commercial and financial sectors, and of the sovereign. Finally, the financial sector plays an important role in promoting and sustaining growth by contributing to a more efficient reallocation of resources. However, when resources are misallocated this can lead to credit and asset price imbalances. Unaddressed, these can have serious consequences for the economies affected and sovereign creditworthiness. These considerations are captured by various indicators for the economic risk factor.

The third key factor captures the various risks of external vulnerabilities of the country in the **External Vulnerabilities** score. These risks are related to external indebtedness and the ability to access external financing and foreign currency to repay external and foreign-currency-denominated obligations. The external risks captured are at the country level, as they not only directly impact the sovereign's external debt repayment capacity but also that of the financial and business sectors. External imbalances and the vulnerability to external shocks have often resulted in sharp currency depreciation, which makes the repayment of foreign-currency-denominated dues, and also imports of goods and services—from food, energy, capital goods and inputs in supply chains—more expensive. The initial assessment of external vulnerabilities is based on an analysis of the current account balance and the net international investment position. Other factors that we deem important are the country's external financing requirements, its vulnerability to terms-of-trade shocks and its external competitiveness versus peers. All of these factors have been associated with episodes of sovereign credit stress and represent potential vulnerabilities. Finally, the status of the official currency of the country in international capital markets and financial transactions is also taken into consideration.

The fourth key factor is an assessment of the general government's fiscal position, which is captured in the **Fiscal Flexibility** score. This score provides an overall assessment for the sustainability and affordability of public finances. The **Fiscal Flexibility** score is the average of two sub-scores: the Fiscal Performance score and the Debt Burden score. The Fiscal Performance score gives an indication of the government's ability to manage its deficit, and its ability to fund this deficit even in times when access to financial markets may be more challenging. The Debt Burden score provides an assessment of the

¹² See section 4.1.1 for additional details on the calculation of the sub-scores.

overall debt level, including potential contingent liabilities from the banking sector, and the debt-servicing costs associated with this debt level. Potential contingent liabilities from the banking sector are taken into consideration, as governments have historically intervened in support of the banking sector on numerous occasions in the past to maintain the critical functions of the financial sector. One of the key innovations of our methodology is the approach proposed to quantitatively account for banking sector vulnerabilities in the **Fiscal Flexibility** score. As recovery and resolution regimes are being implemented, subsequent revisions to our methodology will evolve to reflect the changing risks to the sovereign's balance sheet and creditworthiness.

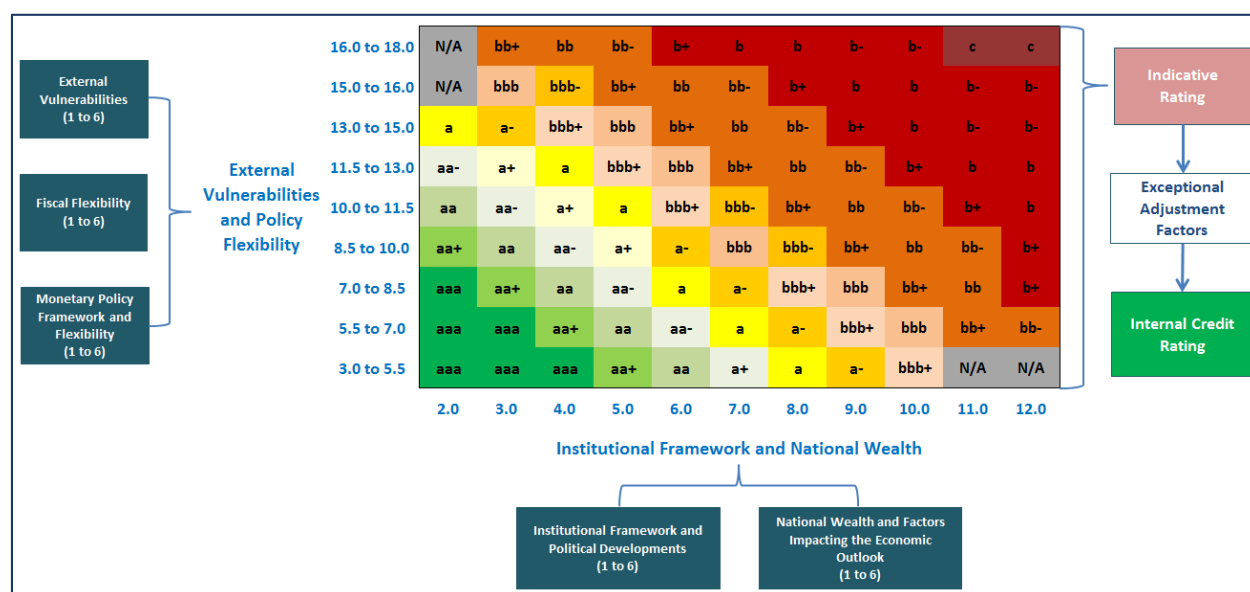
The fifth key risk factor is the **Monetary Policy Framework and Flexibility** score. It captures a sovereign's ability to use monetary policy to address economic stresses. The degree of flexibility and sophistication of monetary authorities as well as success in containing inflationary pressures and preventing asset price imbalances are key factors in assessing the **Monetary Policy Framework and Flexibility** score. Other key considerations are the credibility of monetary authorities, a necessary requirement for achieving the desired monetary policy goal, and the presence of the necessary financial levers through which monetary authorities can implement this desired policy. The approach used to determine the **Monetary Policy Framework and Flexibility** score largely mirrors that used by S&P as published in its 2011 sovereign rating methodology paper.

3.2. Overall Rating Framework

Exhibit 1 shows how the five key risk factors combine to create the indicative rating. The score of the first two factors (**Institutional Framework and Political Developments** and **National Wealth and Factors Impacting the Economic Outlook**) are summed to determine the **Institutional Framework and National Wealth** score. The other three factors (**External Vulnerabilities**, **Fiscal Flexibility** and **Monetary Policy Framework and Flexibility**) are summed to determine the **External Vulnerabilities and Policy Flexibility** profile score. Both are then used to determine the indicative rating of the sovereign as per the matrix in Exhibit 1.

Given the challenges highlighted previously in designing models that would fit the diverse economic, political and legal profiles of all the countries, the methodology includes the flexibility to adjust the indicative rating through the use of "Exceptional Adjustments." These adjustments aim to capture the risks that fall outside the model design and their use relies on insight and expertise by credit analysts. See the section entitled "Exceptional Adjustments" for more detail.

Exhibit 2: Determination of the Indicative and Internal Credit Ratings



3.3. Calibration Exercise

Some of the quantitative thresholds and scoring matrices presented in this paper were selected from the literature on sovereign debt crisis and from the published credit rating methodologies of practitioners. In the majority of cases, however, the thresholds and matrices were determined as the result of calibration work, including back-testing and comparison with benchmarks used by other credit practitioners. We used the available historical data of over 150 sovereigns going back, in some cases, over 20 years. Additional details on the exact sources of data and the time span used in the calibration process are provided in the respective section describing each indicator selected in the methodology.

3.4. Data

As indicated above, the fundamental credit analysis incorporated in our methodology is forward-looking and considers both qualitative and quantitative factors. When forward-looking variables are required, we predominantly use forecasts from the latest International Monetary Fund (IMF) World Economic Outlook (WEO) database and, in one case, the Organisation for Economic Co-operation and Development (OECD) Economic Outlook publication.¹³

¹³ Data from the IMF WEO and OECD Economic Outlook can be found here:

IMF WEO database: <http://www.imf.org/external/ns/cs.aspx?id=28>

OECD Economic Outlook: <http://stats.oecd.org/Index.aspx?DataSetCode=EO>

4. Indicative Rating

4.1. Institutional Framework and Political Developments Score

The **Institutional Framework and Political Developments** score captures a country's institutional features and the effectiveness of policymakers in responding to economic or political events that could affect creditworthiness of the sovereign. This includes both the sovereign's ability *and* willingness to meet its financial obligations. While high-income countries have a much lower incidence of debt default historically, there is also a growing consensus among credit rating practitioners—supported by academic literature—that there is a negative relationship between the quality of a country's institutions and its sovereign's willingness to default on its debt.¹⁴ Including institutional factors in the determination of the rating provides a more robust framework to determine the likelihood of sovereign debt crisis than macroeconomic indicators alone. As a result, the quality of a country's institutions and the ability and willingness of policymakers to mobilize the funds necessary to repay its financial obligations while maintaining social cohesiveness play an important part in determining the **Institutional Framework and Political Developments** score. We also view a predictable policy environment with strong, effective institutions as supportive of economic growth, which also benefits creditworthiness.

Based on the research of rating agencies and other credit rating practitioners, we constructed our model based on four factors that provide an indication of a country's institutional and political creditworthiness: Political Stability, Legal Framework, Policy Effectiveness, and the incidence of Conflict. For each of these sub-factors, we built an index from both objective and survey-based quantitative data from external sources, including the World Bank (Governance Indicators and *Doing Business*), the World Economic Forum (*Global Competitiveness Report*), the United Nations and the Center for Systemic Peace. We present the method to calculate the initial score in further detail in Box 1.¹⁵

We view a stable political system as important in reaching sustainable decisions related to maintaining sound government finances, generating economic prosperity and well-being as well as maintaining peace and order in society. We designed our Political Stability index to capture the stability of the political system and the ability of policymakers to make timely decisions to address all critical issues facing the country. We use data from the World Bank Governance Indicators, the World Economic

¹⁴ See Roubini and Manasse (2005), Kraay and Nehru (2006), Ozturk (2016), and the sovereign rating methodologies of Moody's (Hornung, Byrne and Robinson 2012, 2013), Fitch Ratings (Stringer et al. 2014), Krustins et al. (2014), Riley et al. (2012), S&P (Dimitrijevic et al. 2011 and Chambers et al. 2014), DBRS (Torgerson, McCormick and Reid 2015) and Scope Ratings (Dmitrieva and Theodore 2015).

¹⁵ The data used can be found here:

Center for Systemic Peace: <http://www.systemicpeace.org/inscrdata.html>

Fund for Peace: <http://fsi.fundforpeace.org>

Institute for Economics and Peace: <http://static.visionofhumanity.org/#/page/indexes/global-peace-index>

United Nations Development Programme: <http://www.hdr.undp.org/en/data>

World Bank Doing Business: <http://www.doingbusiness.org/data>

World Bank Governance Indicators: <http://info.worldbank.org/governance/wgi/index.aspx#reports>

World Economic Forum Global Competitiveness Report. <http://reports.weforum.org/global-competitiveness-index/#topic=data>

Forum *Global Competitiveness Report* and the Center for Systemic Peace for the estimation of the Political Stability score.

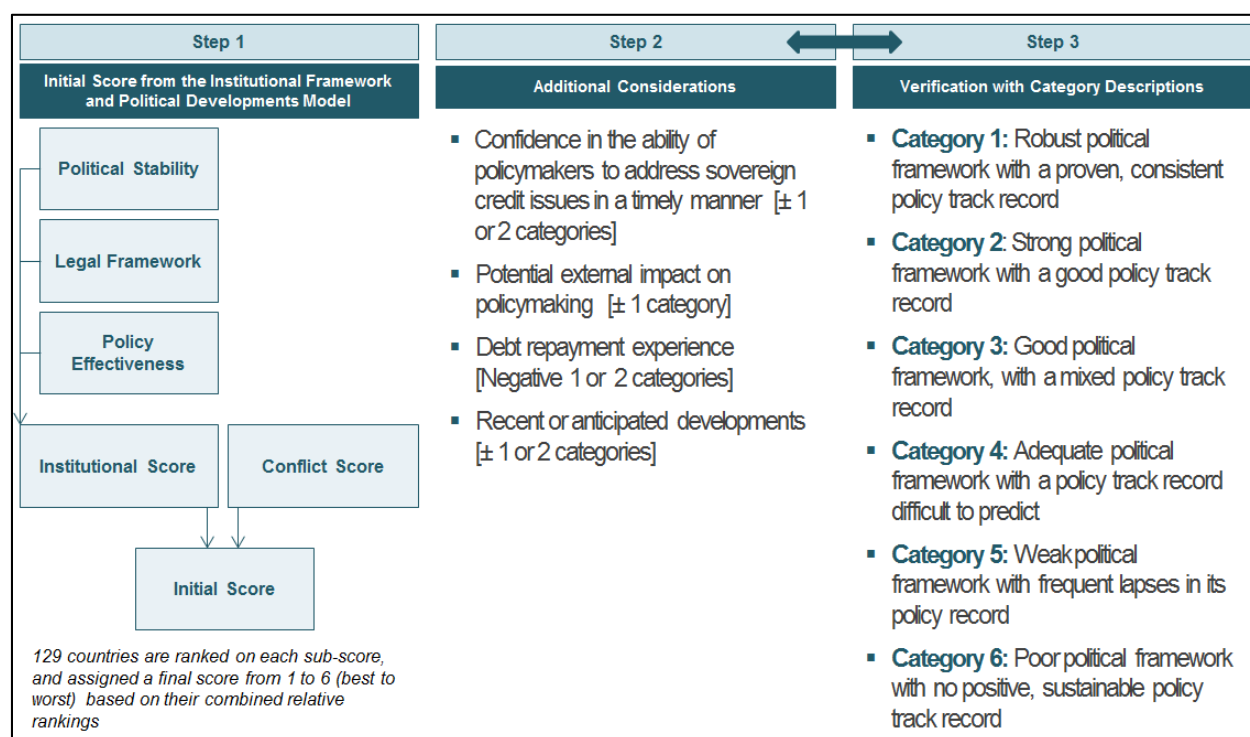
The Legal Framework captures the quality of the legal system in its ability to provide predictable and timely decisions based on the rule of law and legal precedents. In line with other credit rating practitioners, we judge the recognition and enforcement of legal rights and contractual obligations (including debt) by the legal system and the independence of the judiciary (i.e., free of corruption and political influence) as important factors for the development of a country's economy, debt markets and respect of creditors' obligations. We use data from the World Bank Governance Indicators, the World Economic Forum *Global Competitiveness Report* and World Bank *Doing Business* survey for the estimation of the Legal Framework score.

Policy Effectiveness reflects the ability of a country's institutions to implement credible economic, fiscal and social policies in a transparent and timely manner. Ultimately, we expect effective policymaking to deliver high-quality public services and goods to the population, which should be reflected in the indicators we selected. We use data from the World Bank Governance Indicators, the World Economic Forum *Global Competitiveness Report* and the United Nations Development Programme for the estimation of the Policy Effectiveness score.

Our Conflict measure aims to capture the ways through which violent conflicts, or the potential for violent conflicts—both internal and external—affect a sovereign's ability and willingness to meet financial obligations. First, the existence or threat of violent conflicts draws more resources towards defense and security. This can be met through tax increases, increased borrowing, or by diverting spending from other areas. All such developments can potentially be credit-negative for a sovereign. Second, violent conflicts may also effectively disrupt the government's ability to govern. As a result, the government may decide to take drastic actions to maintain itself in power, restore order or defend its territorial integrity, making economic objectives a secondary consideration when determining policy. Finally, there is also the risk that a successor regime may not recognize the debt obligations contracted by its predecessor, particularly if the previous regime was viewed as illegitimate.

To determine the **Institutional Framework and Political Developments** score, we use the three-step process described in Exhibit 1. First, we calculate an initial score for the sovereign based on the Political Risk model, using the four indexes described above. Second, we consider a series of potential adjustments, which are designed to capture the risks not captured by the initial score. Third, we apply a final "Category Verification" step, where we can align the final score with the **Institutional Framework and Political Developments** score's category description (see section 4.1.3 for a more detailed description of each score).

Exhibit 3: Determining the Institutional Framework and Political Developments Score



4.1.1. Determination of the Initial Score for Institutional Framework and Political Developments Score

To determine the initial **Institutional Framework and Political Developments** score, we first combine three of the four factors/indexes we deem important in evaluating a sovereign's creditworthiness (Political Stability, Legal Framework and Policy Effectiveness) into the Institutional score. We describe the calculation method in Box 1. The Institutional score and Conflict score are combined in the matrix presented in Exhibit 3 to obtain the initial **Institutional Framework and Political Developments** score. The matrix was calibrated to obtain results that we deemed appropriate and comparable with similar indicators of major rating agencies. The initial score matrix was corroborated by a back-testing exercise using data going back to 2007.

Box 1: Calculating the Institutional Score and Conflict Score

For a country j , we calculate four sub-indexes: the Political Stability Index, the Legal Framework Index, the Policy Effectiveness Index and the Conflict Index. The calculation of each sub-index (SI_j) is $SI_j = PR\left(\frac{1}{n} \sum_i^n PR_{i,j}\right)$, where $PR_{i,j}$ is the percentile rank of each variable i (as listed in Exhibit 3) for country j in the sub-index, and n is the number of variables in each sub-index. The latest available data are used in all cases. The procedure is as follows:

1. Calculate the percentile rank of each variable in each sub-index.

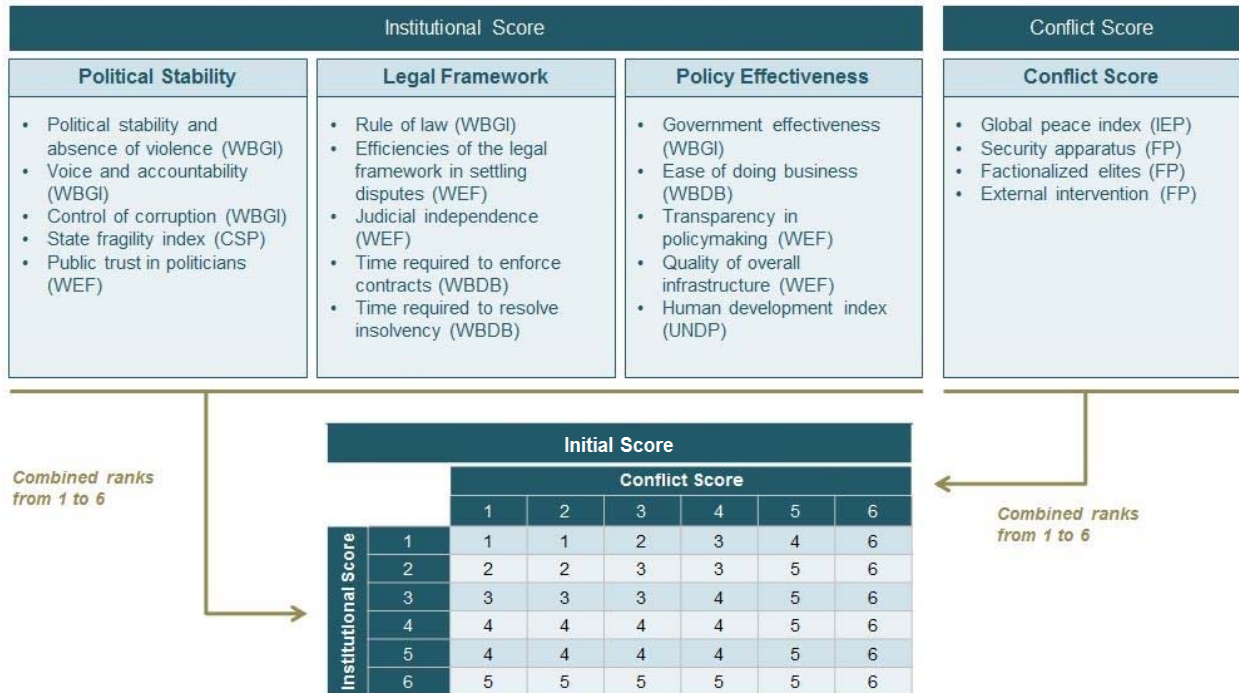
2. For each country, calculate the average of the percentile ranks obtained in 1). Each variable is equally weighted.
3. Calculate the country's percentile rank for the averages obtained in 2).

The Conflict score is based on the Conflict Index calculated as per step 3) above. The Institutional score is based on the Institutional Index, which combines the other three sub-indexes as following:

4. Calculate the average of the Political Stability, Legal Framework and Policy Effectiveness percentile ranks obtained in 3).
5. Calculate the percentile rank of the Institutional index obtained in 4).

The Institutional score and Conflict score are then obtained by dividing the Institutional Index and the Conflict Index into six equal groups. The highest percentile represents the lowest risk and is assigned to Category 1. The lowest percentile represents the highest risk and is assigned to Category 6.

Exhibit 4: Determination of the Initial Institutional Framework and Political Developments Score



CSP: Center for Systemic Peace; FP: The Fund for Peace; IEP: Institute for Economics and Peace; UNDP: United Nations Development Programme; WBDB: World Bank Doing Business; WBGI: World Bank Governance Indicators; WEF: World Economic Forum

4.1.2. Additional Considerations in the Determination of the Institutional Framework and Political Developments Score

After evaluating the initial score, a number of adjustment factors can be applied to reflect risks that may not be captured. The use of these adjustment factors relies on expert judgment of a credit analyst and/or the Credit Rating Committee.

4.1.2.1. *Confidence in the Ability of Policymakers to Address Sovereign Credit Issues in a Timely Manner*

A positive (negative) adjustment of up to two categories may be warranted if it is judged that the most pertinent policy issues from a sovereign credit perspective are being addressed effectively (ineffectively), and the policy environment is likely to improve significantly (continue to stagnate or deteriorate). Protracted delays in implementing urgently needed fiscal and economic reforms, lack of political will or a political deadlock are all factors that can be taken into consideration for this adjustment.

4.1.2.2. *External Impact on Policymaking*

A positive (negative) adjustment of one category can be applied if an external organization has a positive (negative) impact on policymaking; external constraints may be positive in some sovereigns, providing needed outside discipline, but they may be negative in other sovereigns, limiting policy options and/or requiring considerable political capital.

4.1.2.3. *Debt Repayment Experience*

If a sovereign has defaulted on local currency or foreign currency debt obligations—and the default is recognized by at least one of the international credit rating agencies or is identified in the Bank of Canada database of sovereign defaults (see Beers and Mavalwalla 2016)—within the past five years, a negative adjustment of up to two categories is warranted; if the default was not within the past five years but was within the past 10 years, a negative adjustment of one category is warranted.

4.1.2.4. *Recent/Anticipated Developments*

Data used in the Institutional Framework and Political Developments score are annual and may be outdated; a positive (negative) adjustment of up to two categories may be appropriate if recent or anticipated developments are expected to have a significant positive (negative) effect on one or more components of the Institutional score, Conflict score or other factors deemed important to the sovereign's creditworthiness. Such developments are expected to improve (deteriorate) fiscal and economic outcome to an extent that is beneficial (detrimental) to creditworthiness.

4.1.3. Category Verification for the Institutional Framework and Political Developments Score

Once the initial score and adjustment factors have been determined, the methodology proposes to adjust the final score if the result is not broadly aligned with category descriptions. The category descriptions are inspired by the primary and secondary factors used by S&P in its Institutional Effectiveness score.

- **Category 1: Robust political framework with a proven, consistent policy track record**
A sovereign with the highest governance indicators that engages in sound, predictable policymaking, has smooth transitions of power, and virtually no risk of social or political unrest
- **Category 2: Strong political framework with a good policy track record**
A sovereign with good governance indicators that typically adopts and implements policies consistent with maintaining or improving sovereign creditworthiness, has smooth transitions of power that may alter policy, and little risk of social or political unrest
- **Category 3: Good political framework with a mixed policy track record**
A sovereign with adequate governance indicators that may not always immediately adopt or implement policies consistent with maintaining or improving sovereign creditworthiness, has transitions of power that might disrupt policymaking, and social or political unrest may develop
- **Category 4: Adequate political framework with a policy track record difficult to predict**
A sovereign with adequate governance indicators and a policy framework that is difficult to predict, has transitions of power that usually disrupt policymaking, and social or political unrest may develop
- **Category 5: Weak political framework with frequent lapses in its policy record**
A sovereign with weak governance indicators that suffers from frequent lapses in developing or implementing policies consistent with maintaining or improving sovereign creditworthiness, has disruptive changes in leadership, and experiences social or political unrest
- **Category 6: Poor political framework with no positive, sustainable policy track record**
A sovereign with poor governance indicators, without a focus on policies that would improve sovereign creditworthiness, has disruptive changes in leadership, and experiences social or political unrest

4.2. National Wealth and Factors Impacting the Economic Outlook Score

The **National Wealth and Factors Impacting the Economic Outlook** score captures the wealth and economic prospects of a country, which are reflective of the financial resources upon which sovereigns can draw to repay its financial obligations. Wealthy, diversified and flexible economies typically provide a sovereign with a greater potential tax base and therefore a more stable and predictable source of income. While such countries may be just as likely to experience business cycles and shocks, the impact on their sovereign is less likely to result in payment difficulties or defaults on financial obligations. The **National Wealth and Factors Impacting the Economic Outlook** score is agnostic on the system through which resources are allocated to generate wealth and growth, as for the source of the country's wealth.

Growth and its volatility are other important considerations of sovereign creditworthiness. Economic stagnation and abrupt declines in economic activity have been identified by credit assessment practitioners as factors in a number of sovereign defaults and sovereign debt crises. The ability of economies to generate and sustain growth supports debt servicing and the debt dynamics of the commercial and financial sectors, and of the sovereign. Even in wealthy countries, protracted periods of low growth or episodes of an unexpected, rapid drop in growth can lead to deteriorating debt ratios, in some cases very quickly, resulting in an increased likelihood of sovereign credit stress.

The financial sector plays an important role in promoting and sustaining growth by contributing to a more efficient reallocation of resources. However, as the global financial crisis clearly demonstrated, the financial sector can also misallocate resources, contributing to credit or asset price imbalances, such as housing bubbles. The correction of these imbalances can have severe consequences for the economies affected. As such, we take into consideration the presence of credit and asset price imbalances in determining the final **National Wealth and Factors Impacting the Economic Outlook** score. We propose a quantitative tool to determine whether a negative adjustment is warranted.

The process to assign the **National Wealth and Factors Impacting the Economic Outlook** score starts with the determination of an initial score, which is then adjusted to reflect the country's above (below) average trend economic growth relative to peers, the presence of asset price imbalances, and the diversification of the economy or of the volatility of economic growth. The framework of this approach is similar to that used by other credit rating practitioners, although the indicators we selected differ.

4.2.1. Determination of the Initial Score for National Wealth and Factors Impacting the Economic Outlook Score

The initial score estimates the level of wealth in a country. As data on financial and non-financial wealth is sparse in most countries, nominal GDP per capita at purchasing power parity (PPP) is used as a proxy. We use the latest annual GDP¹⁶ data from the IMF *World Economic Outlook* (WEO) to determine the initial score. A higher GDP per capita is associated with a lower risk score and a lower risk of default, and therefore a better credit rating. The initial score thresholds were originally calibrated in 2013 to obtain results that were deemed appropriate and comparable with the distribution of initial scores that the S&P 2011 sovereign rating methodology suggested at that time. These thresholds were confirmed by a back-testing exercise using data going back to 2005. As this data series is non-stationary, the thresholds for each category are revised annually to limit a generalized upward rating drift as a result of global inflationary pressures and to reflect the change in relative level of productivity between countries. This annual revision allows countries' initial scores to improve when their relative trend growth consistently performs better than their category peers.

¹⁶ Unless we explicitly state otherwise, the IMF *World Economic Outlook* is always the source of data for historical and forecasted GDP. This applies to both real and nominal GDP, in local currency, US dollars or at PPP, GDP per capita and GDP growth rates.

Exhibit 5: Determining the National Wealth and Factors Impacting the Economic Outlook Score

Step 1

Initial Score

- Initial Score is based on GDP per capita in US\$ at purchasing power parity exchange rates, using the latest actual data

Initial Score	
GDP per capita in USD (PPP exchange rates)	Score
Over \$38,000	1
\$31,000-\$37,999	2
\$23,000-\$30,999	3
\$12,000-\$22,999	4
\$4,000-\$11,999	5
Below \$3,999	6

Category thresholds were set to minimize differences with the Interim Methodology results (S&P), which used GDP per capita at market exchange rates; Moody's uses GDP per capita at PPP exchange rates, and the Proposed Methodology thresholds are between those of Moody's and S&P

Step 2

Additional Considerations

- Low or High Trend GDP Growth
 - For sovereigns with 10-year trend real GDP per capita growth above/below certain thresholds versus peers - sovereigns with the same Initial Score (peer medians are calculated based on Initial Scores for 180 countries) [± 1 category]

Score	Latest Year Peer Median Growth	Upward Threshold	Downward Threshold	Latest Year Upward Threshold	Latest Year Downward Threshold
1 or 2	0.84	1.5%	-0.5%	2.34	0.34
3 or 4	2.82	4.0%	-1.0%	6.82	1.82
5 or 6	2.89	6.0%	-1.5%	8.89	1.39

- GDP Growth Driven by Credit Growth
 - (1) Rapid increase in non-financial private sector credit growth where credit/GDP is already high (thresholds are credit/GDP > 160% for the latest year and growth of credit/GDP > 2.5 on average for the current and previous 2 years) or (2) there is evidence of a credit-fueled asset price bubble [Negative 1 category]
- GDP Growth Volatility
 - Very volatile real GDP growth (threshold is 10-year standard deviation of more than 4.7, current year and previous 9 years) [Negative 1 category]

4.2.2. Additional Considerations in the Determination of the National Wealth and Factors Impacting the Economic Outlook score

The second step in assigning the **National Wealth and Factors Impacting the Economic Outlook** score is determining whether or not to adjust the initial score, based on the factors described below. These potential adjustment factors are not applied mechanistically, particularly in borderline cases. The decision to apply an adjustment factor relies on expert judgment of a credit analyst and/or the Credit Rating Committee, and is informed by the quantitative metrics outlined and any additional quantitative and qualitative information relevant to the analysis.

4.2.2.1. High (Low) Trend Growth Relative to Peers

A sovereign's **National Wealth and Factors Impacting the Economic Outlook** score can be upgraded (downgraded) by one category when its trend growth is significantly better (worse) than other countries with a similar level of wealth, as measured by the initial score. The method of calculating a country's trend growth and the definition of peer groups retained for this adjustment are similar to those used by

S&P in its 2011 sovereign rating methodology.¹⁷ However, we propose a different approach to calculate the thresholds for a positive (negative) adjustment. We set the thresholds using the standard deviation of growth rates for each peer group, which we found allows for an evenly balanced distribution of positive versus negative adjustments across categories and through time. As per the S&P approach, we propose more stringent requirements to assign a positive versus a negative adjustment for this factor. In other words, it is more difficult to receive a positive adjustment, which requires trend growth to be at least one standard deviation above the peer group's median, while a negative adjustment can be assigned when the standard deviation is half a standard deviation below the peer group's median.

4.2.2.2. Credit or Asset Price Imbalances

A sovereign's **National Wealth and Factors Impacting the Economic Outlook** score can receive a one-notch negative adjustment if there is evidence of credit or asset price imbalances.¹⁸

Box 2: Determination of Credit or Asset Price Imbalances

Credit Imbalances: When credit is expanding at an unsustainable pace, certain indicators used in the evaluation of the **National Wealth and Factors Impacting the Economic Outlook** score, such as GDP per capita and trend growth, may be overestimated and vulnerable to a correction. This would result in a more favourable assessment of the **National Wealth and Factors Impacting the Economic Outlook** score than warranted by the fundamental economic conditions. In those cases, a negative adjustment can be applied. The assessment for Credit Imbalances is informed by non-financial private sector credit growth exceeding nominal GDP growth by a significant margin over the previous three-year period. The formula to determine the pace of credit expansion is $CE = \frac{\frac{1}{3}\sum_{-3}^{-1}C_{t+1}/C_t}{\frac{1}{3}\sum_{-3}^{-1}GDP_{t+1}/GDP_t}$, where CE is credit expansion, GDP is nominal gross domestic product in local currency and C is non-financial private sector credit. This criterion is met when CE is greater than 2.5. This adjustment applies to economies where credit to GDP is already high, exceeding 160 per cent. The threshold we use is the one proposed by the EU in its 2012 *Alert Mechanism Report*¹⁹ to identify macroeconomic imbalances. A country does not receive a positive adjustment if "Credit Imbalances" are deemed to be low. The source of credit data for this adjustment is the Bank for International Settlements (for the non-financial private sector credit).

Table 1: Thresholds for Credit Imbalances—Additional Considerations

Criterion	Threshold
Credit to GDP (%)	> 160%
Credit Expansion (GDP growth/Credit growth)	> 2.5

¹⁷ The trend growth is calculated using a 10-year weighted average of historical and forecasted annual growth rates. The forecasted growth rates used in the calculation of a country's trend growth are sourced from the most recent IMF WEO. Please refer to the S&P 2011 *Sovereign Government Rating Methodology And Assumptions*.

¹⁸ Note that in cases where both conditions are met, the Economic score would receive a one-notch negative adjustment.

¹⁹ See European Commission (2012).

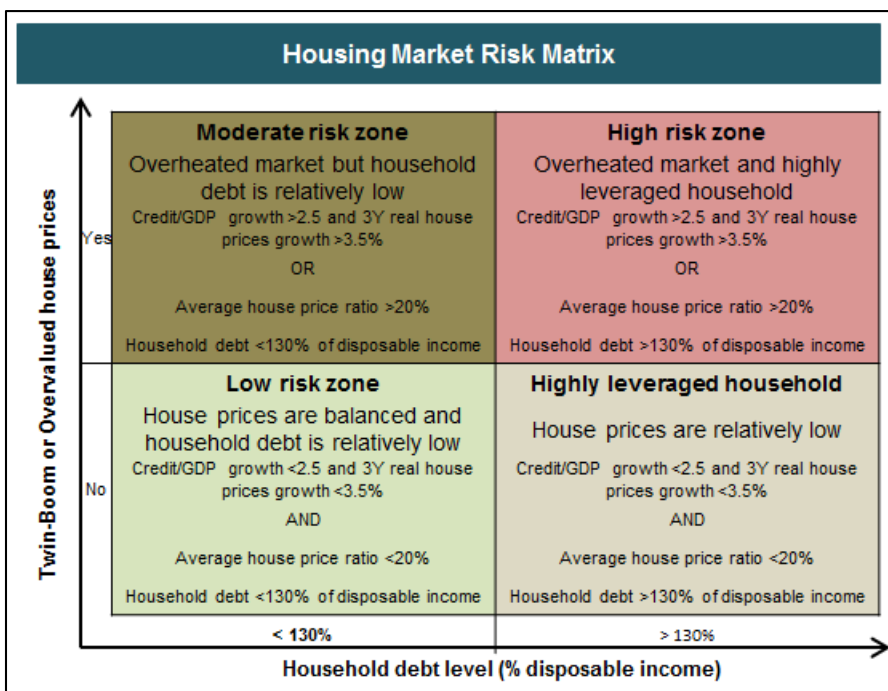
Asset Price Imbalances—Equity Markets: A negative adjustment can be applied when the country's equity market is judged to be overvalued. For the assessment of the equity market, the retained metric is the same one used by S&P in its Banking Industry Country Risk Assessment (BICRA). A negative adjustment for asset price imbalances can be applied when a country's equity market capitalization is greater than 20 per cent of the country's GDP, and equity prices (as measured by the country's main equity price index) have increased by an average of 40 per cent or more over two consecutive years.

Table 2: Thresholds for Asset Price Imbalances—Equity Markets

Criterion	Threshold
Market Capitalization to GDP (%)	> 20%
Change in Equity Prices, 2-year average (%)	> 40%

Asset Price Imbalances—Housing Sector: For the housing sector, we developed a framework that takes into account household debt, credit growth, real house price growth, and price-to-income and price-to-rent ratios. When a country's housing sector is in the "high risk zone," a negative adjustment to the **National Wealth and Factors Impacting the Economic Outlook** score may be applied. Note that a negative adjustment is not automatically applied when a country is deemed to be in the high risk zone, as various aspects of the country's housing market are also taken into account before the final determination on an adjustment is made. A country's housing sector is deemed to be in the high risk zone when (i) household debt is greater than 130 per cent of GDP, (ii) the ratio of overall credit growth to nominal GDP growth exceeds a factor of 2.5 on average over the most recent three-year period, and (iii) real housing prices have increased by more 3.5 per cent per year on average over the last three years. Alternatively, a country is also in the high risk zone if (i) household debt is greater than 130 per cent of GDP, and (ii) the average of the OECD price-to-income and price-to-rent ratios are above their long-term trends by more than 20 per cent.

Exhibit 6: Determination of Housing Sector Imbalances



The sources of data for this part of the adjustment are the countries' main stock index, Bank for International Settlements, IMF IFS, OECD and national sources.

4.2.2.3. Volatile GDP Growth

The **National Wealth and Factors Impacting the Economic Outlook** score can receive a one-notch negative adjustment if a country's economy is concentrated in a small number of sectors, and these sectors are prone to a high degree of volatility. This adjustment will typically be applied to countries where the oil and gas, agricultural or mining sectors represent a significant share of the economy and exports. To evaluate this adjustment, we look at the 10-year annual real GDP growth rate volatility (from t_{-10} to t_{-1}) and assign a negative adjustment if the standard deviation exceeds 4.7, the threshold used by Moody's to assign its riskiest score (VL-) for this same factor in its Economic Strength evaluation.

4.3. External Vulnerabilities Score

The **External Vulnerabilities** score captures the external risks that the country faces. These risks are related to the level of external indebtedness and the ability to access external funding and foreign currency to repay external and foreign-currency-denominated obligations. While the monetary authorities of a country control the supply of local currency (except for those using another country's currency or those part of a monetary union), contracting debt in foreign currencies requires the country to generate foreign exchange earnings to repay these obligations. Given the relationship between

currency crises, financial crises and sovereign debt crises documented by academics and credit rating practitioners,²⁰ external risks apply not only to the sovereign but to the financial and business sectors as well. These would also be affected by a shortage of hard currencies. External imbalances and the vulnerability to external shocks has often resulted in sharp currency depreciation, which makes the repayment of foreign-currency-denominated dues, but also imports of goods and services—from food, energy, capital goods and inputs in supply chains—more expensive.

A country's challenge to generate foreign currency earnings may come from different sources. Sustained current account deficits over time can deplete a country's foreign exchange reserves or lead to an accumulation of external debt to finance these shortfalls. Countries with large amounts of short-term external debt are even more exposed to rollover risk from external shocks and a rapid deterioration of the external environment. Another important factor to consider when assessing a country's external vulnerability is its overall external financing requirement. Countries with large external financing requirements (often associated with a large banking sector reliant on external wholesale funding) are typically characterized as having a high level of short-term external debt relative to gross external debt, and an overall high level of gross external debt relative to GDP.

Another consideration in assessing a country's external vulnerability is the diversification of its export base. Countries with a concentrated export base, such as commodity exporters, are also vulnerable to terms-of-trade shocks from a sudden drop in the global price of a key export commodity. Additionally, significant deterioration or improvement in external competitiveness would also affect local companies' ability to compete with foreign firms, which would impact the current account balance, and is therefore also a consideration in our methodology.

Finally, the status of the currency in international capital markets and financial transactions is also taken into account. Certain currencies, such as those held by central banks in their foreign exchange reserves, have historically received greater international investor confidence during times of stress. As noted by Fitch Ratings, these currencies are less likely to experience funding stress because of stable demand for assets denominated in their currency. This supports these countries' general ability to sustain higher levels of external imbalances.

The process to assign the **External Vulnerabilities** score starts with the determination of an initial score based on the current account balance and net international investment position, as shown in Exhibit 4. The initial score is then adjusted to reflect the country's currency status in international capital markets, its external financing and liquidity risk, the volatility in its terms of trade and significant changes in its external competitiveness.

²⁰ See Roubini and Manasse (2005), Schimmelpfennig, Roubini and Manasse (2003), Kraay and Nehru (2006), Reinhart and Rogoff (2010a and 2010b), and the sovereign rating methodologies of Moody's, Fitch Ratings, S&P, DBRS and Scope Rating. Reinhart and Rogoff (2010b) also cite the work of Michael Bordo, Barry Eichengreen, Marc Flandreau, Lindert and Morton, and Alan Taylor as a non-exhaustive list of researchers who have published on this topic.

Exhibit 7: Determination of the External Vulnerabilities Score

Step 1							Step 2																																																													
Initial Score							Additional Considerations																																																													
<ul style="list-style-type: none">Initial Score is based on the current account balance (% GDP) and net international investment position (% GDP)							<ul style="list-style-type: none">Reserve Currency Status<ul style="list-style-type: none">For sovereigns with an actively traded or reserve currency [Positive 1 or 2 categories]External Financing/Liquidity Risk<ul style="list-style-type: none">Countries with a marked risk of deterioration in external financing, typically characterized by having a high level of short-term external debt relative to gross external debt, and a high level of gross external debt relative to GDP [Negative 1 category]Terms of Trade Volatility<ul style="list-style-type: none">Countries exposed to significant volatility in their terms of trade (higher than the 75th percentile of 10-year standard deviations) [Negative 1 category]External Competitiveness<ul style="list-style-type: none">Countries in which external competitiveness is improving/deteriorating significantly based on changes in the real effective exchange rate [± 1 category]																																																													
<table><tr><th rowspan="2">Net IIP (% GDP)</th><th colspan="6">Current Account Balance (% GDP)</th></tr><tr><th>> 3%</th><th>3.0% to -1.0%</th><th>-1.1% to -3.5%</th><th>-3.6% to -6.0%</th><th>-6.1% to -9.0%</th><th>< -9%</th></tr><tr><td>> 10%</td><td>1</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>10% to -10%</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>-11% to -30%</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>6</td></tr><tr><td>-31% to -50%</td><td>3</td><td>4</td><td>5</td><td>6</td><td>6</td><td>6</td></tr><tr><td>-50% to -90%</td><td>4</td><td>5</td><td>6</td><td>6</td><td>6</td><td>6</td></tr><tr><td>< -90%</td><td>5</td><td>6</td><td>6</td><td>6</td><td>6</td><td>6</td></tr></table>							Net IIP (% GDP)	Current Account Balance (% GDP)						> 3%	3.0% to -1.0%	-1.1% to -3.5%	-3.6% to -6.0%	-6.1% to -9.0%	< -9%	> 10%	1	1	2	3	4	5	10% to -10%	1	2	3	4	5	6	-11% to -30%	2	3	4	5	6	6	-31% to -50%	3	4	5	6	6	6	-50% to -90%	4	5	6	6	6	6	< -90%	5	6	6	6	6	6							
Net IIP (% GDP)	Current Account Balance (% GDP)																																																																			
	> 3%	3.0% to -1.0%	-1.1% to -3.5%	-3.6% to -6.0%	-6.1% to -9.0%	< -9%																																																														
> 10%	1	1	2	3	4	5																																																														
10% to -10%	1	2	3	4	5	6																																																														
-11% to -30%	2	3	4	5	6	6																																																														
-31% to -50%	3	4	5	6	6	6																																																														
-50% to -90%	4	5	6	6	6	6																																																														
< -90%	5	6	6	6	6	6																																																														
<p>Current account is a 5-year average centred on the current year; net IIP is the latest available data (IMF WEO).</p> <p>Category thresholds for current account scores based on data for 180 countries over 30 years, dividing into 6 equal groups and taking the 30-year average threshold between groups.</p> <p>Category thresholds for IIP scores based on data for 100 countries over 10 years.</p>																																																																				

4.3.1. Determination of the Initial Score for External Vulnerabilities

We determine the initial **External Vulnerabilities** score based on the current account balance (CAB), which includes all current cross-border transactions between residents and non-residents, and the net international investment position (net IIP), which indicates the balance between the country's external assets (including foreign exchange reserves) and its external liabilities. Both the CAB and net IIP are expressed as a percentage of GDP. The net IIP includes the country's external debt, but also other external liabilities such as accounts payable. The CAB is a five-year average centred on the current year, while the net IIP is the latest available data. The data source for the CAB is the IMF WEO, and the source for the net IIP is the IMF International Financial Statistics (IFS).

We calibrated the category thresholds for the current account scores based on annual data for 180 countries over 30 years. The CABs, expressed as a percentage of GDP, are ranked and divided into six roughly equal groups, based on percentiles. The group with the highest percentile is defined as Category 1, the second highest as Category 2, and so forth. The category thresholds for net IIP scores are calculated similarly, based on data for 100 countries over 10 years. To ensure that the thresholds remain robust, we calibrate them annually to include additional annual data and historical data revision as they become available.

4.3.2. Additional Considerations in the Determination of the External Vulnerabilities Score

The second step in assigning the **External Vulnerabilities** score is determining whether or not to adjust the initial score, based on the factors described below. The use of these adjustment factors relies on expert judgment of a credit analyst and/or the Credit Rating Committee. The decision to apply an adjustment factor is informed by the quantitative metrics outlined and any additional quantitative and qualitative information relevant to the analysis.

4.3.2.1. Reserve Currency Status

As discussed previously, this adjustment factor represents the dominant position of certain currencies in international trade settlement, trade financing and in foreign exchange reserve portfolios. The **External Vulnerabilities** score can receive an uplift of one or two notches for this factor. The decision to apply this adjustment factor is based on expert judgment from the Credit Rating Committee and informed by the Bank of International Settlements (BIS) Triennial Central Bank Survey of foreign exchange and derivatives market activity in 2013, as well as the committee's view of the country's rule of law and investor protection, which support a country's status (and its currency) as a "safe haven." This uplift is not provided to countries that use another country's currency.

4.3.2.2. External Financing/Liquidity Risk

The **External Vulnerabilities** score can receive a one-notch negative adjustment when the country has a large amount of short-term external debt that is exposed to refinancing or rolled-over risk. This adjustment typically applies to countries with large banking sectors that rely on external financing to fund their operations. The most recent year of available data is used. The two key variables used to assess this criterion are the ratio of short-term (under one year) external debt to gross external debt, and the ratio of gross external debt to GDP. The thresholds for these two ratios were estimated using external debt data from the BIS, and are set at the 15-year average of the 75th percentile for each year. In other words, we calculated the 75th percentile for each of the previous 15 years, and used the average of the 75th percentile over that period as the thresholds for a negative adjustment. Data from the BIS are available for approximately 80 countries.

Table 3: Thresholds for Determining the External Financing/Liquidity Risk—Additional Considerations

Criterion	Threshold
Short-Term External Debt to Gross External Debt (%)	> 40%
Gross External Debt to Gross Domestic Product (%)	> 130%

4.3.2.3. Terms of Trade Volatility

A country's **External Vulnerabilities** score can receive a negative adjustment if it is exposed to volatile terms of trade. This criterion is used predominantly in emerging markets where exports and foreign exchange earnings depend heavily on a limited number of commodities whose prices tend to show significant fluctuation throughout the business cycle. The reliance on a narrow export base leaves countries vulnerable to a sudden drop in the price of these commodities. As a result, the trade and current account balances will often see a sharp deterioration as imports tend to adjust less quickly than exports. The data for this indicator come from the World Bank's World Development Indicators database (net barter terms of trade). The country's terms-of-trade volatility is calculated as the 10-year standard deviation. The threshold for a negative adjustment is set at the 75th percentile of the 10-year average standard deviation for the 161 countries available.

4.3.2.4. External Competitiveness

A country can be considered for a positive or negative adjustment to its **External Vulnerabilities** score if it is deemed that its external competitiveness has improved or deteriorated significantly versus competitors over the last 10 years. The first step of this assessment considers the change in the country's real effective exchange rate²¹ (REER) and unit labour costs²² (ULC) relative to peers during that period. The measure we use is an average of the REER and ULC, with the base year for both being set at 100 in t₋₁₀. We then compare this 3-year average with the median of the 3-year averages of peer countries. A country whose competitiveness indicator is at or below (above) one standard deviation of its peers' median can be considered for a positive (negative) adjustment. We recognize that the REER and the relative ULC are not comprehensive measures of external competitiveness. As a supplementary step, we also use the World Economic Forum Efficiency Enhancers (EE) score to help define the product and labour market development level and complement the REER/ULC analysis. The EE score covers six pillars: higher education and training, goods market efficiency, labour market efficiency, financial market development, technological readiness and market size. With scores on a 1 to 7 scale, 148 countries were ranked in 2014. Here also, we compare the country's three-year average EE score with its peers, with the threshold for a positive (negative) adjustment set at 1.5 standard deviation above (below) the median.

²¹ The REER is a measure of the value of a currency against a weighted average of several foreign currencies (the nominal effective exchange rate) divided by a price deflator or index of costs to represent the relative change in prices or costs between countries.

²² Unit labour costs (ULC) measure the average cost of labour per unit of output and are calculated as the ratio of total labour costs to real output.

Table 4: Calculation of Thresholds for External Competitiveness—Additional Considerations

Competitiveness Adjustment	Criteria
Positive adjustment	3-year average REER & ULC index \leq Median - 1 STD 3-year average Efficiency Enhancers score \geq Median + 1.5 STD
Negative adjustment	3-year average REER & ULC index \geq Median + 1STD 3-year average Efficiency Enhancers score \leq Median - 1.5 STD

4.4. Fiscal Flexibility Score

The **Fiscal Flexibility** score provides an overall assessment of the sustainability and affordability of public finances. Except where explicitly noted, we use general government fiscal indicators, even though our rating applies to the central government. General government consists of the combination of the central, state and local governments and all the social security funds that they control. The reason for considering general government fiscal indicators instead of those of the central government is because arrangements between a central government and sub-national governments for the sharing of provision of public services and taxation powers differ quite substantially from country to country. Irrespective of which level of government delivers the public services and which one collects the taxes, the overall tax base available to the different levels of government is the same. As such, we believe it is appropriate to consider the fiscal situation of all levels of sub-national governments under the central government.

The **Fiscal Flexibility** score is the average of two sub-scores: the Fiscal Performance score and the Debt Burden score. The ability of a government to service its debt depends on a number of factors beyond the deficit and debt level themselves. For example, because of advanced economies' credit histories (i.e., long track record of honouring their sovereign debt), the depths of their financial markets and diversified tax bases, they are able to carry a much higher level of debt than emerging markets.

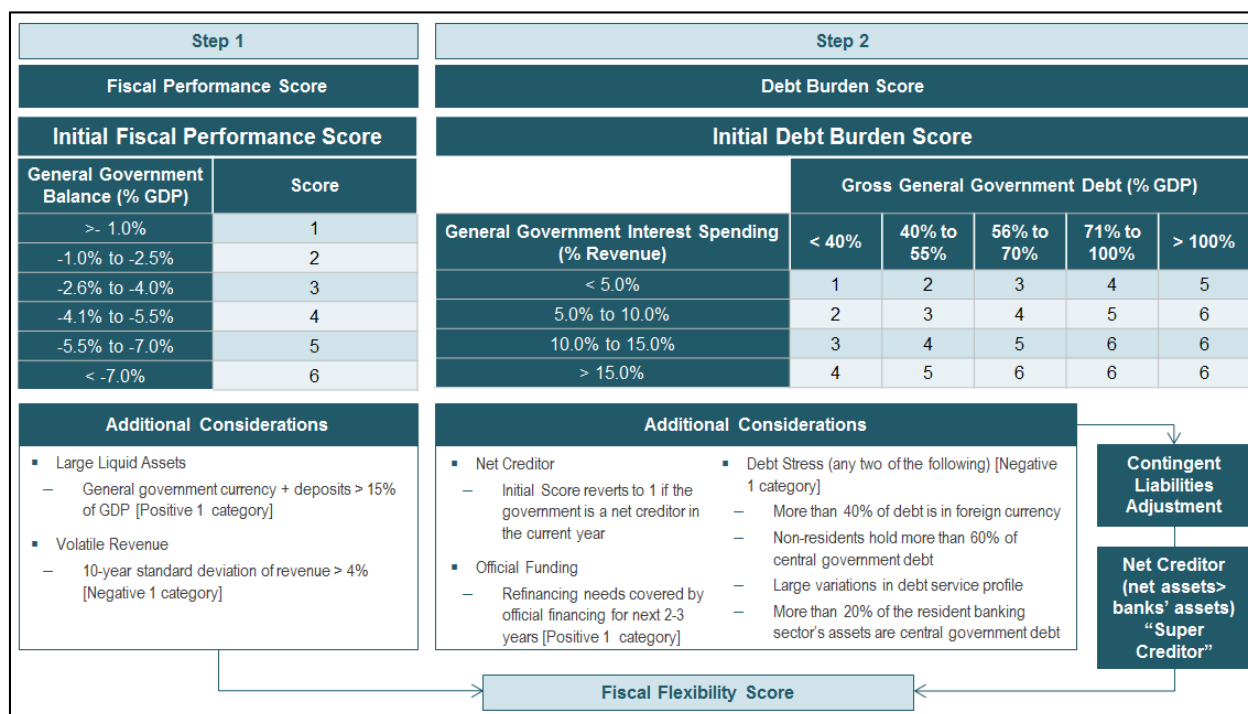
The first sub-score, the Fiscal Performance score, indicates the government's ability to limit its deficit, and its ability to fund this deficit even in times when access to financial markets may be constrained. While fiscal deficits may be desirable in times of crisis to act as a countercyclical buffer, or to fund public infrastructure, they nonetheless impact debt dynamics through the accumulation of debt. On a forward-looking basis, however, we would expect governments to rein in deficits to prevent debt from accumulating to a level that is unsustainable. Other factors considered in the Fiscal Performance score are the size of government liquid assets and the volatility of its revenues, both of which can affect a government's ability to finance its operations at all times.

The second sub-score, the Debt Burden score, assesses the overall debt level, including potential contingent liabilities from the banking sector, and the debt-servicing costs associated with this debt level. An over-accumulation of debt limits government policy flexibility and has been identified by practitioners as a factor that increases sovereign default risk.²³ The ability to service this debt without

²³ See the sovereign rating methodologies of Fitch Ratings, Moody's, S&P, DBRS and Scope Ratings.

imposing a heavy tax burden on the economy or jeopardizing the other critical functions of government is also an important consideration in assessing the sustainability of the government's debt level. Other factors affecting the sustainability of the debt include the debt profile: the maturity profile, the currency composition, the residence of debt holders and the level of reliance on the domestic banking sector as a source of funding. Finally, potential contingent liabilities from the banking sector are also taken into consideration. To maintain the critical functions of the financial sector and prevent systemic risk from materializing, governments have intervened on numerous occasions in the past to prevent financial institutions from collapsing. This intervention has often led to an increase in the gross debt burden of governments. Governments around the world are implementing reforms to ensure that shareholders and creditors of failing banks bear losses.²⁴ Therefore, we will revise our approach to reflect the changing nature of these risks as more of the ongoing reforms are implemented across a range of sovereigns.

Exhibit 8: Determining the Fiscal Flexibility Score



²⁴ Additional information on the status of regulatory reforms by country is available on the [Financial Stability Board website](#).

4.4.1. Step 1: Determination of the Initial Score for the Fiscal Performance Score

We assign the Initial Fiscal Performance score by calculating the government's average fiscal balance, expressed as a percentage of GDP, over a four-year time span and comparing the result with the thresholds in the left-hand side table in Exhibit 6. The four-year time span we use includes the previous year, current year and two-year forecast. We use the data from the most recent IMF WEO for this calculation. The thresholds for the initial score were originally calculated using the historical general government fiscal balances from the IMF WEO database from 1985 to 2012 for 184 countries. We recalibrate the thresholds annually using the latest IMF WEO database to include additional annual data and historical data revision as they become available. The category thresholds are determined by ranking and dividing the fiscal balances into six roughly equal groups, based on percentiles. The threshold for Category 1 is set at the average of the fifth group, for Category 2 at the average 4th group, and so forth.

4.4.2. Additional Considerations for the Determination of the Fiscal Performance Score

The Fiscal Performance score also takes into consideration the following factors:

4.4.2.1. Large Liquid Assets

A government holding a substantial amount of liquid assets provides a buffer should its access to financial markets be curtailed. These assets would allow the government to continue to operate normally by paying wages and bills and servicing its debt. We propose that to be effective, this buffer should be sufficient to cover gross financing requirements for the current year. Gross financing requirements consist of the government fiscal balance (surplus or deficit), its short-term debt (debt with a maturity of less than one year), and medium- and long-term debt repayments on principal and interest due during the year. We define our general government liquid assets ratio (LAR) as $LAR_t = \frac{GGCD_t}{GDP_t} \times 100$, where $GGCD$ is the general government's cash and deposits, GDP is the country's gross domestic product and t is the reference year. We further define the general government gross financing requirement ratio (GFRR) as $GFRR_t = \frac{STD_t - GGFB_t + MLTDD_t}{GDP_t} \times 100$, where STD is the general government short-term debt (i.e., debt maturing in a year or less), $GGFB$ is the general government fiscal balance,²⁵ and $MLTDD$ is principal and interest payments due on maturing medium- and long-term debt from 1 January to 31 December of the year in question (t). A sovereign can receive a positive adjustment to its Fiscal Performance score if its LAR at the end of the previous year (t) exceeds 10 per cent of GDP.

²⁵ Note that surpluses subtract from gross financing requirements, while deficits add to them.

However, we would apply a positive adjustment only when the LAR_t exceeds $GFRR_{t+1}$, or $LAR_t - GFRR_{t+1} > 0$.

Given that fiscal surpluses are recorded as negative values in the calculation of gross financing requirements, we use the two-condition structure to prevent a situation where a sovereign would potentially receive a positive adjustment even though its LAR is low. The data on cash and deposits come from the OECD and the IMF IFS database. Data are available for 35 countries since 1999. Data on gross financing requirements are available from the IMF *Fiscal Monitor* for 57 countries since 2010. Since the IMF reports gross financing requirements as a percentage of GDP in its *Fiscal Monitor* publication, we normalize cash and deposits as a share of GDP as well.

Table 5: Thresholds for the Determination of Large Liquid Asset—Additional Considerations

Large Liquid Asset—Necessary Conditions for Adjustment	Threshold
Liquid Asset Ratio is Greater than 10% of GDP	$LAR_t > 10\%$
Liquid Asset Ratio Exceeds Gross Financing Requirement Ratio	$LAR_t - GFRR_{t+1} > 0\%$

4.4.2.2. Volatile Revenues

A volatile revenue base makes fiscal planning more difficult, as expenditures are far more rigid. This adjustment would typically apply to sovereigns that rely heavily on royalties from mining or oil extraction. To set the threshold for this adjustment, we first calculated the 75th percentile of the 10-year standard deviation of the annual change in general government revenues as a percentage of GDP. The threshold is set at the long-term average (1994–2014) of the 75th percentiles. We used data for 184 countries from the IMF WEO.

4.4.3. Determination of the Initial Score for the Debt Burden Score

The initial Debt Burden score is determined from the right-hand side table in Exhibit 7, based on the gross general government debt level as a percentage of GDP and the general government interest spending, expressed as a percentage of revenues. The general government debt-to-GDP ratio used in the determination of the initial score is the average of the most recent year, the current year and the subsequent two years. The calculation is based on the latest IMF WEO data. For the general government interest spending, the initial score is determined using the average of the most recent year, current year and one-year outlook. When available, the current year and outlook are based on the OECD forecast in its latest *Global Economic Outlook* publication. For non-OECD countries, we use the latest available data from the World Bank's World Development Indicators database.

Our approach to determine the initial Debt Burden score is largely inspired by the 2011 S&P methodology for rating sovereigns. We propose the category thresholds for general government debt interest spending as a share of revenues published by S&P in its 2011 sovereign rating methodology. A

key difference in our approach is the use of gross general government debt as a share of GDP. In most cases, we view the gross general government debt as more relevant than net general government debt, given that gross debt represents the contractual obligations of the government, and that the government's ability to liquidate its assets in a timely fashion to offset unexpected financing shortfalls may be limited, particularly in a stress scenario. The category thresholds for the gross general government debt-to-GDP ratio were calibrated to obtain a distribution of initial scores that was broadly comparable to the one obtained by using S&P's methodology for the initial score for Debt Burden. The results were back-tested using annual data for 180 countries over 30 years. To ensure that the thresholds remain robust, we calibrate them annually to include additional annual data and historical data revision as they become available.

An additional consideration is made for sovereigns when the general government assets exceed their liabilities. These government assets often comprise state pension funds, sovereign wealth funds and strategically important national companies. These assets generally give greater financial flexibility to governments and as such, in instances where assets exceed liabilities, we propose to set the initial Debt Burden score at Category 1. It should also be noted that the general government net debt does not include future liabilities related to pension and other age-defined benefits. We share the view generally held among practitioners that these liabilities are not on par with other contractual financial obligations. As such, governments maintain a certain degree of flexibility to adjust future payouts and preserve fiscal sustainability. The determination of this adjustment is based on the estimates from the most recent IMF WEO, when net general government debt is less than zero.

4.4.4. Additional Considerations for the Determination of the Debt Burden Score

The Debt Burden score also takes into consideration the following factors:

4.4.4.1. Debt Profile

The level of risk associated with the debt burden will vary based on the debt profile. Considerations include the currency in which the debt is denominated, the nationality of debt holders, the maturity profile and the share of the banking sector's assets that consists of government debt. A one-notch negative adjustment to the Debt Burden score can be applied when any two of the following conditions are met:

- **More than 40 per cent of the general government debt is denominated in foreign currency.** A large amount of debt denominated in a foreign currency raises the risk of a rapid deterioration in debt-servicing costs and debt sustainability from a devaluation or depreciation of the country's currency. A drop in the value of the country's currency has an immediate impact on debt ratios and adds pressure on debt repayment, as a greater amount of local currency is needed to repay foreign-currency-denominated debt. For advanced economies, the main source of data for this factor is the OECD *Public Sector Debt* database. When this source is not available, information on the currency

composition of long-term foreign debt from the World Bank International Debt Statistics can provide some information.

- ***More than 60 per cent of the general government debt is held by non-residents.*** Debt held by non-residents includes debt denominated both in local currency and in foreign currency. We consider debt held by non-residents to be more susceptible to capital flight than debt held by residents. The main source of data for this factor is the last annual data point available in the BIS/IMF/World Bank Quarterly External Debt Statistics database.
- ***The debt maturity profile is subject to large annual variations or is of short tenor.*** This factor applies to a sovereign facing a debt repayment profile that contains a large increase from year to year at some point in the next five years. This increase may come, for example, as the result of a large or series of large bonds maturing. Alternatively, a sizeable share of the government debt may be maturing in the coming year, and is therefore susceptible to refinancing risk. The main sources of data are Bloomberg (Debt Distribution – DDIS), the IMF *Fiscal Monitor* and the World Bank Global Development Finance statistics.
- ***The domestic banking sector has a large exposure to the central government.*** This factor applies when the banking sector claims on the central government exceed 20 per cent of assets. A banking sector in which government paper is already a large share of overall assets may have limited capacity to absorb additional debt without crowding out the private sector, or may incentivize higher government debt burdens. The data for this factor come from the IMF IFS database; the last available year of data is used.

4.4.4.2. Official Funding Covers Gross Financing Requirements

The Debt Burden score can be improved by one notch when funding from official sources (for example the IMF, World Bank or European Stability Mechanism) is sufficient to cover gross financing requirements over the next two to three years. This adjustment applies only to countries whose government has run into financial difficulties and is receiving or is due to receive a funding package from a multilateral institution. Bilateral funding arrangements between countries are not considered. The adjustment is contingent on the expectation that funding conditions will be met by the authorities of the recipient country.

4.4.4.3. Potential Contingent Liabilities from the Banking Sector

A sovereign's Debt Burden score can receive a negative adjustment of up to three notches depending on the level of potential contingent liabilities. We developed and propose a quantitative approach to assess potential contingent liabilities. We find this approach to be a key innovation to credit risk assessment practices. See Box 3 for more details.

Box 3: Determination of Potential Contingent Liabilities from the Banking Sector

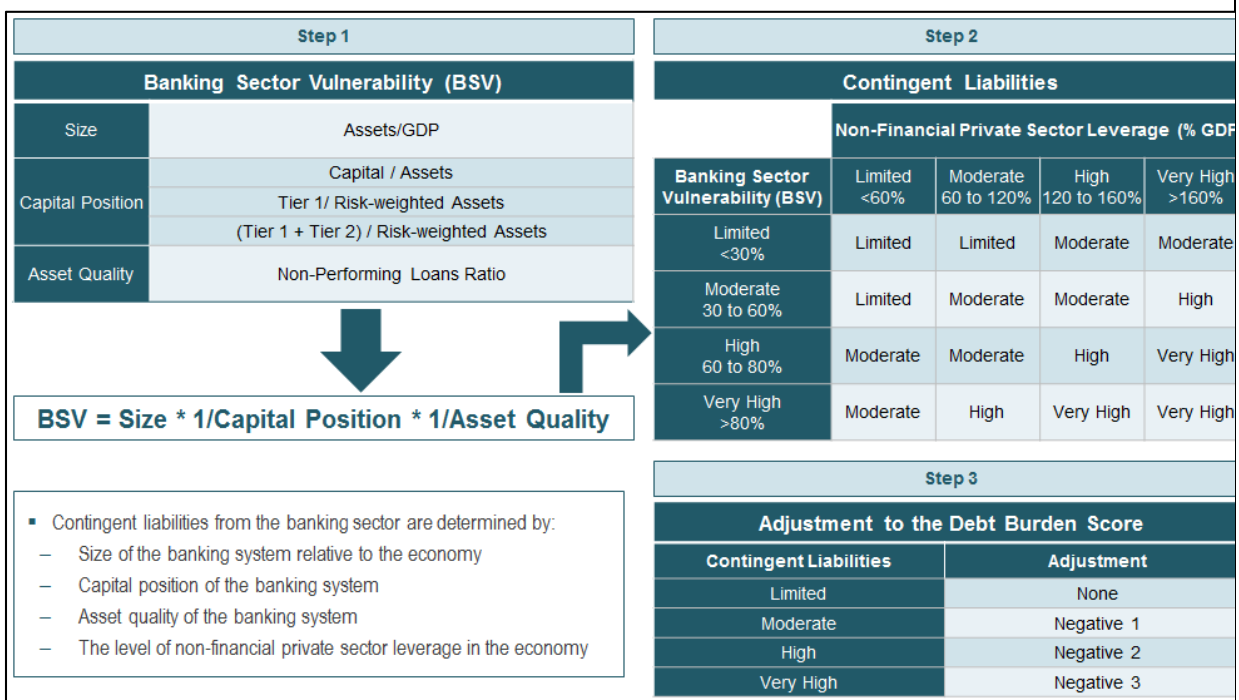
A sovereign's Debt Burden score can receive a negative adjustment of up to three notches depending on the level of potential contingent liabilities. The analysis is focused on the overall size, capitalization and asset quality of the banking sector, as well as the amount of leverage in the domestic economy from the non-financial private sector. These factors give us an indication of the likelihood and size of the potential need for government support. We recognize that government interventions to recapitalize the banking sector have historically been through the purchase of shares. As a result, the increase in government debt is offset by the value of the assets it has acquired. Nonetheless, we focus our analysis on the liabilities side to maintain consistency with our Debt Burden score approach and to recognize the challenges associated with pricing a bank's assets at a time when the market for such assets may be limited. As such, the future value of these assets is uncertain. Moreover, governments have historically socialized the cost of their interventions in the banking sector. As governments around the world are implementing reforms to ensure that shareholders and creditors of failing banks bear losses before taxpayers, we will revise our approach to reflect the changing nature of these risks. The present discussion paper will be updated when more of the ongoing reforms are implemented across a range of sovereigns.

To determine the level of potential contingent liabilities ("Limited," "Moderate," "High," or "Very High"), we look at the level of domestic debt in the household and non-financial corporate sector, and calculate a Banking Sector Vulnerability (BSV) indicator. We define the level of non-financial private sector debt (NFPD) as $NFPD_t = \frac{NFCD_t + HHD_t + NPISHD_t}{GDP_t} \times 100$, where $NFCD$ is non-financial corporate sector debt, HHD is household debt, and $NPISHD$ is the debt of non-profit institutions serving households. The BSV is a combination of: (i) the asset size of banking sector relative to GDP (BSAR): $BSAR_t = \frac{BSA_t}{GDP_t} \times 100$, where BSA is the banking sector's assets; (ii) the level of capitalization, defined regulatory Tier 1 and Tier 2 capital, relative to assets (CAR): $CAR_t = \frac{T1C_t + T2C_t}{BSA_t} \times 100$, where $T1C$ is Tier 1 capital (including Tier 1 common equity and additional Tier 1), and $T2C$ is Tier 2 capital; and (iii) the level of non-performing loans relative to total loans (NPLR): $NPLR_t = \frac{NPL_t}{GL_t} \times 100$, where NPL is the total non-performing loans of the banking sector, and GL is total gross loans. Overall, we estimate the BSV as $BSV_t = \frac{BSAR_t \times NPLR_t}{CAR_t}$. We then use $NFPD_t$ and BSV_t to determine the adjustment to the Debt Burden score, as per the table in the top right-hand side of Exhibit 8. The Debt Burden score will be negatively adjusted by one notch when contingent liabilities are deemed "Moderate," two notches when deemed "High," and three notches when deemed "Very High." In cases where the initial Debt Burden score is already at the worst possible score of 6, the sovereign's final rating may be adjusted through an Exceptional Adjustment (see Exceptional Adjustments section below) to reflect these potential contingent liabilities.

The data on household and non-financial corporate sector debt are sourced from various national statistics agencies and central banks, while data for the BSV come from the IMF IFS database.

An additional consideration is given to sovereigns whose net asset position exceeds the liabilities of the banking sector. If these sovereigns' net asset positions are larger than the liabilities of the banking sector, any adjustment to the Debt Burden score for potential contingent liabilities is removed.

Exhibit 9: Determination of Potential Contingent Liabilities from the Banking Sector



4.5. Monetary Policy Framework and Flexibility Score

The approach used to determine the **Monetary Policy Framework and Flexibility** score largely mirrors the approach used by S&P as published in its 2011 sovereign rating methodology paper. The **Monetary Policy Framework and Flexibility** score captures a sovereign's ability to use monetary policy to address economic stresses. The degree of flexibility and sophistication of monetary authorities as well as their demonstrated ability to contain inflationary pressures and prevent asset price imbalances and deflation are key factors in assessing the **Monetary Policy Framework and Flexibility** score. Other key considerations are the credibility of monetary authorities, a requirement for achieving the desired monetary policy, and the presence of the necessary financial levers through which monetary authorities can implement this desired policy.

Exhibit 10: Determination of the Monetary Policy Framework and Flexibility Score

Step 1						Step 2
Initial Score						Additional Considerations
▪ Initial Score is based on an average of factors as per the table below						<ul style="list-style-type: none">▪ Negative Adjustments [1 category each]<ul style="list-style-type: none">– Deflation over (t-1) to (t+3)– High dollarization of deposits or loans– Sovereign is part of a monetary union– History of exchange restrictions▪ Negative Adjustments [2 categories]<ul style="list-style-type: none">– Sovereign is part of a monetary union and shows prolonged price/wage divergences from union average, or divergence of credit conditions▪ Score can't be better than 4 if inflation over (t-1) to (t+3) is 10 to 15%▪ Score can't be better than 5 if inflation over (t-1) to (t+3) is 15 to 20%▪ Score of 6 if any of the following applies:<ul style="list-style-type: none">– Sovereign uses unilaterally the currency of another country as local currency– Dollarization of deposits or loans > 75%– Inflation over (t-1) to (t+3) > 20%
Initial Monetary Policy Framework and Flexibility Score						
	1	2	3	4	5	
Exchange rate	Free float	Floating	Free/floating with short track record, or rates not effective on capital flows, or soft peg	Conventional peg or peg consistent with monetary policy of host country	Hard peg (currency board)	
Monetary policy credibility	Well-established and well-regarded operational record, fully autonomous operations, clear mandate and targets, policy conducted via varied instruments	Historically autonomous in operations, policy conducted via market-based instruments	Autonomous operations with limited operational record, policy effected largely via reserve requirements	Autonomous operations with limited operational record, limited confidence in policy instruments	External (i.e. political) influence exerted on operations, ineffective transmission mechanisms	
Transmission mechanism effectiveness	Govt debt > 20yr maturity, mkt capmaturity, > 75% GDP, domestic claims > 100% GDP	Govt debt > 10yr maturity, mkt capmaturity, > 50% GDP, domestic claims > 80% GDP	Govt debt > 5yr maturity, mkt capmaturity, > 25% GDP, domestic claims > 60% GDP	Govt debt < 5yr maturity, mkt capmaturity, > 10% GDP, domestic claims > 40% GDP	Govt debt < 5yr maturity, mkt capmaturity, < 10% GDP, domestic claims < 40% GDP	

4.5.1. Determination of the Initial Score for Monetary Policy Framework and Flexibility Score

The initial **Monetary Policy Framework and Flexibility** score is determined by averaging three sub-scores on a scale of one to five, and rounding to the nearest integer. The three sub-scores are described below.

4.5.1.1. Exchange rate regime

This sub-score follows the approach laid out in the most recent IMF *Annual Report on Exchange Arrangements and Exchange Restrictions*. This approach is largely aligned with the S&P approach described in its 2011 sovereign methodology. For countries classified as *Other managed arrangement*, we assess the score on an *ad hoc* basis, based on our internal view of the risks relative to other exchange rate arrangements, on a one-to-five scale.

4.5.1.2. Monetary policy credibility

This sub-score is a qualitative assessment of various elements that affect the credibility of monetary authorities. While credibility is not a sufficient condition for monetary authorities to achieve the desired policy, we view it as necessary that market participants believe that monetary authorities will act in accordance with their stated objective. Considerations in assessing this sub-score include the central bank's degree of *de facto* operational independence, taking into account the Control of Corruption and Rule of Law World Bank Governance Indicators of the country, the period of time since the establishment of an independent central bank, the process

used for nominating board members, and the array of tools at the disposal of the central bank.

4.5.1.3. *Depth of capital markets*

This sub-score is an assessment of the presence and depth of capital markets, another necessary condition for the transmission of monetary policy objectives to the real economy. The assessment is based on the capacity of the central government to issue long-term bonds denominated in local currency, the presence of a deep corporate bond market and a developed banking system, and a sizeable level of bank loans in local currency.

4.5.2. Additional Considerations for the Determination of the Monetary Policy Framework and Flexibility Score

A number of factors can result in a one-notch negative adjustment to the **Monetary Policy Framework and Flexibility** score or constrain the overall **Monetary Policy Framework and Flexibility** score. We present here our interpretation of these factors. Readers should refer to S&P methodology for more information on these potential adjustments to the Monetary Policy score:

4.5.2.1. *Expected Deflationary Pressures*

The **Monetary Policy Framework and Flexibility** score can be adjusted when deflation is expected to persist for the foreseeable future, as the presence of deflation impedes monetary policy flexibility.

4.5.2.2. *High Dollarization of Deposits or Loans*

The **Monetary Policy Framework and Flexibility** score can be adjusted when there is a substantial presence of parallel currencies in the financial system, either in the form of deposits or loans, which prevents the effective transmission of monetary policy.

4.5.2.3. *History of Exchange Restrictions*

The **Monetary Policy Framework and Flexibility** score can be adjusted if, over the course of the last 20 years, a sovereign has unilaterally imposed transfer and convertibility restrictions in response to balance of payments pressures.

4.5.2.4. *The Sovereign is Part of a Monetary Union*

This adjustment reflects the loss of monetary sovereignty and flexibility when joining a monetary union, as the central bank for the union is expected to base decisions on what is appropriate for the union as a whole rather than a specific country. In cases where price and/or wage growth differ significantly from the union average (typically around 2 per cent per year above the union average over a period of three years), a negative adjustment of two notches can be applied.

4.5.3. Restrictions on the Monetary Policy Framework and Flexibility Score

As we expect monetary authorities to achieve a low and stable inflation environment, we place restrictions on the final **Monetary Policy Framework and Flexibility** score of countries that fail to achieve this objective. We also put restrictions on the final **Monetary Policy Framework and Flexibility** score of countries that have very limited flexibility or ability to achieve an independent monetary policy.

4.5.3.1. Countries with High Inflation

The final **Monetary Policy Framework and Flexibility** score can be no better than “4” if, on average, the inflation rate for the five-year period composed of the previous year, current year and three-year forecast is between 10 per cent and 15 per cent.

4.5.3.2. Countries with Very High Inflation

The final **Monetary Policy Framework and Flexibility** score can be no better than “5” if, on average, the inflation rate for the five-year period composed of the previous year, current year and three-year forecast is between 15 per cent and 20 per cent.

4.5.3.3. Countries with Extremely High Inflation

The final **Monetary Policy Framework and Flexibility** score is set at “6” when the average inflation rate for the five-year period composed of the previous year, current year and three-year forecast is greater than 20 per cent.

4.5.3.4. Countries with No Separate Legal Tender

The final **Monetary Policy Framework and Flexibility** score is set at “6” if the latest *IMF Annual Report on Exchange Arrangements and Exchange Restrictions* classifies the country as having “No separate legal tender.”

4.5.3.5. Countries with a Highly Dollarized Banking Sector

The final **Monetary Policy Framework and Flexibility** score is set at “6” when over 75 per cent of bank deposits or loans from the banking sector are denominated in a foreign currency.

5. Exceptional Adjustment Factors and the Final Internal Credit Rating

The final internal credit rating is determined after applying a number of checks and potential adjustments to the indicative rating. As presented in section 3.2, the indicative rating is determined by the Institutional Framework and National Wealth Profile (**Institutional Framework and Political Developments** score and **National Wealth and Factors Impacting the Economic Outlook** score) and the Flexibility and Performance Profile (**External Vulnerabilities** score, **Fiscal Flexibility** score and **Monetary Policy Framework and Flexibility** score) using the matrix in Exhibit 1.

5.1. Exceptional Adjustment Factors

There are a number of reasons why additional adjustments to our model-suggested indicative rating may be warranted. Even in a comprehensive methodology, models may not adequately capture all risks. While we believe that the framework performs well, there may be challenges when applying the

methodology to a specific country. An Exceptional Adjustment is proposed only when material risks are not appropriately captured in the five risk factors.

As indicated in section 3, the sovereign rating models we use are designed to provide an assessment of the credit quality for all countries. This approach raises challenges in developing a methodology that reflects the different levels of income and wealth levels of a country, the sources of a country's wealth and income, the political and legal systems, and the monetary policy implemented by the country's central bank or monetary authorities.

While our models allow some room for analyst judgment, the models are predominantly driven by quantitative factors. In some cases, issues related to the availability and quality of the data needed to run the models may arise. The required data may not be available for the country in question, the quality of the data may be doubtful, or it may exist but with a significant lag. As a result, the current situation in the country may be significantly different than what the models suggest, given these and other data issues. Finally, a key risk indicator may be significantly worse than the threshold needed for the worst possible score, in which case the full extent of the risk to the sovereign's creditworthiness may not be adequately represented.

5.1.1. Exceptional Adjustment for Peer Comparison/Indicative Rating Matrix Gap

A sovereign's indicative rating may be adjusted by one notch up or down when there is sufficient evidence to suggest that the balance of risks is more commensurate with the peer rating group immediately above or below the indicative rating.

Alternatively, the indicative rating may be one notch higher or lower than the matrix in Exhibit 1 if the adjacent horizontal or vertical cell is different by two notches and a change in only one score (**Institutional Framework and Political Developments, National Wealth and Factors Impacting the Economic Outlook, External Vulnerabilities, Fiscal Flexibility or Monetary Policy Framework and Flexibility**) would lead to a two-notch change in the indicative rating.

5.1.2. Exceptional Adjustment for Extremely Weak Fiscal Position

A negative adjustment of one or more notches to the indicative rating can be applied when a sovereign has been assigned the lowest Fiscal Performance score or the lowest Debt Burden score but its fiscal performance or debt burden is materially weaker than the benchmark for the weakest Fiscal Performance or Debt Burden scores.

5.1.3. Exceptional Adjustment for Extremely Weak External Liquidity

A negative adjustment of one or more notches to the indicative rating can be applied when we judge that a sovereign that has already received a negative adjustment to the **External Vulnerabilities** score based on the External Financing/Liquidity factor has a material weakness in

this area, or that the country's access to external liquidity may deteriorate sharply over the rating horizon of three to five years.

5.1.4. Exceptional Adjustment for Very High Liquid Assets

A positive adjustment of one notch to the indicative rating can be applied when a sovereign has access to an exceptionally large pool of readily available liquid assets. We propose this adjustment factor only for sovereigns that have liquid assets of more than 100 per cent of GDP.

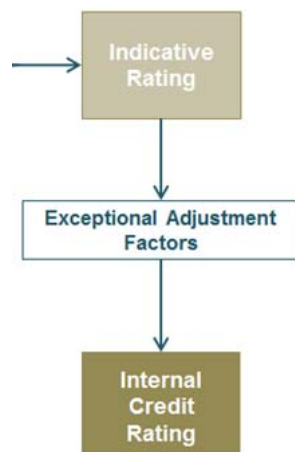
5.1.5. Exceptional Adjustment for Event Risk

A positive or negative adjustment of one or more notches to the indicative rating can be applied when we assess that there is imminent or rapidly rising external or internal political risks, or when the country has recently experienced a severe natural catastrophe that may have a significant impact on economic activity and the sovereign's creditworthiness.

5.2. Final Internal Credit Rating

As presented in Exhibit 11, we obtain the final internal credit rating by applying the sum of notches from the Exceptional Adjustment Factors (if any) to the Indicative Rating.

Exhibit 11: Determination of the Final Internal Credit Rating



6. Conclusion and Future Considerations

In this paper, we present a detailed technical description of the methodology used to assign internal credit ratings to sovereigns. We designed the methodology to generate ratings that are broadly in line with those of credit rating agencies, but reflect the staff view of the creditworthiness of the sovereigns being assessed using only publicly available data.

We developed the methodology for the management of Canada's foreign exchange reserves, building upon best practices from other practitioners' methodologies. In the methodology development process, we also leveraged internal expertise at the Bank of Canada and implemented the following key innovations: (i) a quantitative approach to assess political risks, (ii) a framework to assess the government's potential contingent liabilities related to the banking sector, and (iii) a framework to determine the presence of asset prices imbalances in the country.

As a result of the calibration and back-testing we applied during the development process, the sovereign rating methodology presented in this paper generates results that are broadly in line with historic credit ratings produced by various credit risk practitioners. The Bank and Department of Finance Canada are thus able to assess the relative creditworthiness of the various sovereigns and any other entity deemed important to evaluate. Despite a quantitative focus of the methodology, we have the ability to make adjustments in response to changes in the credit quality that occur as a result of a deterioration in the economic, political or financial environment.

The application of the methodology has also generated insights that are used to inform and support investment and management decisions. Given the high quality of the ratings, we include them as part of our existing internal credit risk management and investment policies. This has also allowed the Bank and Department of Finance Canada to end mechanistic reliance on the ratings from CRAs.

We intend for this paper to support efforts by reserve managers and other investors to end mechanistic reliance on CRA ratings and instead establish or strengthen internal credit assessment practices. The methodology presented can be used by credit risk practitioners to assess the relative credit quality of sovereign as is, or by facilitating a process to develop a methodology that caters to the specific needs of an institution. This will also improve the ability of reserve managers and other investors to manage credit risk and enhance the financial performance of their portfolios. Our methodology also provides means to monitor indicators that reflect the key credit risk factors of sovereigns and ways to apply expert judgment on these in order to infer a credit rating of any sovereign.

We intend to continue to refine our methodology, in line with best practices and new research, and to update this paper to detail the new approaches. We identify a few topics of potential future research to improve our methodology, including the impact of new bail-in regimes on the potential sovereign contingent liabilities as well as to stress-test our models to assess the vulnerability to domestic and external shocks.

7. References

- Baas, D. 2010. "Approaches and Challenges to Political Risk Assessment: The View from Export Development Canada." *Risk Management* 12 (2): 135–162.
- Bank of Canada. 2013. Bank of Canada *Financial System Review* (June).
- Beers, D.T. and J. Mavalwalla. 2016. "Database of Sovereign Defaults, 2016." Bank of Canada Technical Report No. 101.
- Chalk, N. and R. Hemming. 2000. "Assessing Fiscal Sustainability in Theory and Practice." International Monetary Fund Working Paper No. 00/81.
- Chambers, J. B., M. Kraemer, K. Tan, S. Briozzo, C. Esters, K. Stukenbrock, T. Cullinan, O. I. Kalinina, L. A. Collett, L. J. Feinland Katz and A. Petrov. 2014. "Sovereign Rating Methodology." Standard & Poor's.
- Cavanough, M., J. B. Chambers and M. McGraw. 2013. "Common Characteristics of Rated Sovereigns Prior to Default." Standard & Poor's.
- Correa, R. and H. Saprizza. 2014. "Sovereign Debt Crises." Board of Governors of the Federal Reserve System: International Finance Discussion Paper No 1104.
- Dmitrieva, I. and S. Theodore. 2015. "Analytical Guidelines for Assessment of Sovereign Credit Risk." Scope Ratings.
- Dimitrijevic, A., D. T. Beers, J. Chambers, M. Kraemer and C. Woodell. 2011. "Sovereign Government Rating Methodology and Assumptions." Standard & Poor's.
- European Commission. 2012. "Alert Mechanism Report 2012." <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52012DC0068>
- Hemming, R. and M. Petrie. 2000. "A Framework for Assessing Fiscal Vulnerability." International Monetary Fund Working Paper No. 00/52.
- Hornung, D., T. J. Byrne and M. Robinson. 2012. "Proposed Refinements to the Sovereign Bond Rating Methodology." Moody's Investors Services.
- Hornung, D., T. J. Byrne and M. Robinson. 2013. "Sovereign Bond Ratings." Moody's Investors Services.
- Kraay, A. and V. Nehru. 2006. "When Is External Debt Sustainable?" *World Bank Economic Review* 20 (3): 341–365.
- Krustins, K., G. Kiss, T. Stringer and D. Renwick. 2014. "Sovereign Rating Model." Fitch Ratings.
- Lundberg, L., D. Aurora, S. Jain, A. Bala, E. Volland, H. Semder, S. Bugie, A. De Toytot, H. Wright and V. Sharma. 2011. "Banking Industry Country Risk Assessment Methodology and Assumptions." Standard & Poor's.

Ozturk, H. 2016. "Reliance of Sovereign Credit Ratings on Governance Indicators." *European Journal of Development Research* 28 (2): 184–212.

Reinhart, C. M. 2002. "Default, Currency Crises, and Sovereign Credit Ratings." *The World Bank Economic Review* 16 (2): 151–169.

Reinhart, C. M., K. S. Rogoff and A. Savastano. 2003. "Debt intolerance." National Bureau of Economic Research Working Paper No. 9908.

Reinhart, C. M. and K. S. Rogoff. 2010a. *This Time Is Different: Eight Centuries of Financial Folly*. Princeton University Press.

Reinhart, C. M. and K. S. Rogoff. 2010b. "From Financial Crash to Debt Crisis." National Bureau of Economic Research Working Paper No. 15795.

Riley, D., T. Stringer, R. Fox and A. Colquhoun. 2012. "Sovereign Rating Criteria." Fitch Ratings.

Roubini, N. and P. Manasse. 2005. "'Rules of Thumb' for Sovereign Debt Crises." International Monetary Fund Working Paper No. 05/42.

Schimmelpfennig, A., N. Roubini and P. Manasse. 2003. "Predicting Sovereign Debt Crises." International Monetary Fund Working Paper No. 03/221.

Stringer, T., J. McCormack, R. Fox, D. Renwick, A. Colquhoun and K. Krustins. 2014. "Sovereign Rating Criteria." Fitch Ratings.

Torgerson, T., F. J. McCormick and A. G. Reid. 2015. "Methodology: Rating Sovereign Governments." DBRS.