

Toolkit for the Identification, Measurement, Monitoring, and Risk Management of Contingent Sovereign Liabilities

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Abstract^{*}

Sovereign contingent liabilities materialize when uncertain future events, which are largely beyond the State's control, occur. They can represent a significant burden for public finances and jeopardize public debt management and sustainability. This paper presents a toolkit for the identification and systematization, measurement, monitoring, and reporting of these liabilities. Based on the proposal of a general methodology, the toolkit develops specific estimation methodologies for different categories of sovereign contingent liabilities. These methodologies are then applied in hypothetical exercises, complemented with illustrations taken from the international context. Furthermore, to illustrate how the toolkit might be applied, the paper provides examples that test sensitivity to changes in the variables and parameters that affect contingent liabilities. The study demonstrates that the toolkit can help to achieve improved and better-informed management of public debt and sovereign contingent liabilities, as well as of their associated financial and fiscal risks.

JEL Codes: C51, C65, E62, H63, H68, H81.

Keywords: contingent liabilities, deposit insurance, estimation, financial risks, fiscal risks, legal claims, maximum exposure, natural disasters, private sector guarantees, public–private partnerships, public sector guarantees, sovereign funds.

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Acronyms

EC European Commission

FAP Panama Savings Fund (Fondo de Ahorro de Panamá)

FEES Economic and Social Stabilization Fund (Fondo de Estabilización Económica y Social)
(Chile)

GDP Gross domestic product

ICSID International Centre for Settlement of Investment Disputes

LAC Latin America and the Caribbean

LRSF Social and Fiscal Responsibility Law (Ley de Responsabilidad Social Fiscal de Panamá)

MRG Minimum revenue guarantee

NPV Net present value

PPP Public–private partnership

SOEs State-owned enterprises

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1. Introduction

Sovereign contingent liabilities are liabilities that materialize only when specific uncertain future events occur, which are generally outside the control of governments.¹ They can represent a significant burden for public finances and hamper public debt management and sustainability. To prevent or mitigate undesirable effects, contingent liabilities must be identified, measured, monitored, and reported.

The treatment of contingent liabilities can: (i) identify a wide range of fiscal risks; (ii) define effective actions for mitigating these risks; (iii) reduce financing costs; (iv) achieve better traditional debt management (for example, by considering contingent liabilities when it comes to planning debt issuance or repurchase); (v) provide improved data for debt sustainability analysis; and (vi) facilitate implementation of more comprehensive and integrated sovereign asset and liability management.

Until recently, this treatment was deemed more necessary in developing countries, which were generally more volatile, higher indebted, and in some cases had less sophisticated and/or less transparent fiscal management and budgetary register/accounting methodologies than developed countries. This hypothesis, however, had to be discarded following the recent financial crisis that particularly affected Europe and the United States. As a consequence of that crisis, the European Commission (EC), for example, has begun to treat the costs of state support to the financial system as contingent liabilities (Eurostat, 2012, 2014). Similarly, in July 2013, Eurostat—the EC’s office of statistics—decided to collect and publish information about contingent liabilities and other potential liabilities. The Excessive Deficit Procedure furthermore established member states’ obligation to report, among other items, guarantees and public–private partnerships (PPPs) not included in their budgets.

While a few countries in Latin America and the Caribbean (LAC) have been working on this topic for some time, others have only recently begun to do so. In the last few years, they have amended their regulatory and institutional frameworks to better manage the issues raised by contingent liabilities (such as the use of PPPs for infrastructure provision).

Analysis of contingent liabilities should not only consider them in terms of stocks; it should also consider the volume of flows. Contingent liabilities could entail problems in any given period in which there are significant possible disbursements. In other words, flows are just as important

¹ The conceptual aspects of contingent liabilities are addressed in detail in Demaestri, Moskovits, and Chiara (forthcoming); Cebotari (2008), and Polackova (1998). Gadano, Moskovits, and Artana (2010) present guidelines on the treatment of liabilities and a basic classification. The methodology proposed by Demaestri, Gadano, and Moskovits (2013) is a first methodological development of the toolkit presented in this paper.

as stocks when it comes to debt management, because the impact of the contingencies is not isolated from the macroeconomic context in which they occur. A liability risk profile that provides information about both stocks and flows must therefore be established. Additionally, monitoring itself helps prevent origination of possible undesirable contingent liabilities and aids in the choice of type of financing.

The toolkit presented in this paper makes it possible to identify and classify contingent liabilities, measure them, provide information (both in terms of stocks and flows) for monitoring purposes, conduct stress testing using alternative scenarios, and report the outcomes. This establishes the basis for designing risk-management mechanisms and implementing mitigation mechanisms. This paper presents the toolkit and its direct uses. Recommendations on managing the contingent liabilities identified and measured, which can be monitored and analyzed—and even tested with different general and specific behavior hypotheses—by using this toolkit, are beyond the scope of this study. General references in this respect can be found in Demaestri, Moskovits, and Chiara (forthcoming). Likewise, precise observations on liability management and risk mitigation should, strictly speaking, be confined to each particular case, depending on the liability's characteristics and its context.

Following this introduction, the paper is organized as follows: Section 2 defines and classifies contingent liabilities. Section 3 presents an outline of the toolkit and its direct applications. Section 4 reveals the general measurement scheme proposed for the toolkit. Sections 5 to 11 present, for each of the considered contingent liabilities, a conceptual description, an estimation methodology, hypothetical cases, and actual examples whenever possible. Section 12 summarizes the contingent liability estimates obtained by applying the toolkit to a hypothetical case. Section 13 provides stress-testing exercises that show what happens when the values of different variables and parameters in the estimates are adjusted, which, at the same time, reveals the toolkit's flexibility and potential. The final section presents the main conclusions concerning the usefulness of the data generated by the toolkit, proposes future steps, and suggests ways in which this dynamic device might be perfected over time.

2. Contingent Liabilities and their Typology

Having described the objectives of this study and the framework for the analysis, and before moving onto the toolkit itself, it is necessary to accurately define some of the concepts and classifications applied. These definitions must be presented to limit the universe of liabilities under consideration. Thus, for example, not all unregistered liabilities are contingent liabilities. There are

numerous cases in which accounting problems lead to the conclusion that some liabilities are contingent when, in fact, they are not. Furthermore, there are often conceptual differences when it comes to defining contingent debts and the scope of the public sector to be considered. The toolkit is based on the following definitions and concepts:

Sovereign: the scope of the public sector includes the central government and social security institutions and, if existing, the legally established sovereign funds that are directly linked to contingent liabilities.

Contingent liabilities: liabilities whose effective enforceability and measurement in terms of amounts, interest rates, repayment periods, and so on are subject to unpredictable future events that are beyond the State's control. In general, therefore, there is uncertainty as to whether or not payment will be required, its potential amount in the event payment is required, and/or the period(s) of occurrence.

Explicit contingent liabilities: these liabilities arise as a result of financial, legal, or contractual agreements in which the State participates, which include requirements that are conditional on a certain event occurring before the payments stipulated in the agreement are disbursed. In this case, the decision that originated the contingent liability has already been taken. The requirements only become effective if one or more of the stipulated conditions actually happens or, in the case of legal claims, if the State fails to comply with its commitments. To summarize, this category of contingent liabilities always originates in an explicit event that takes place before the liability materializes.

Implicit contingent liabilities: these liabilities arise as the result of an intervention that has not been formally established beforehand, due to the occurrence of a certain condition or an unexpected event (e.g., economic shock or natural disaster). They refer to situations in which the State, due to either a policy decision or a critical social situation, uses public resources to tackle emergencies of an economic, climatic, or environmental nature. Given the breadth of the universe of events, there is general consensus that, for analytical purposes, the sources of implicit contingent liabilities should be limited. Hence, in general, natural disasters and systemic financial crises are considered to cause this kind of liability, although bailouts of subnational governments or state-owned enterprises (SOEs) might also be responsible. The scope of the contingent liability could depend on the probability of occurrence and the scale of the potential public intervention.

Therefore, while explicit contingent liabilities are mostly linked to guarantees—or counter-guarantees—given by the public sector as a correlate of a formal and explicit commitment (law, contract, and so on), implicit contingent liabilities are linked to issues that, although unregulated, bear a (high) probability that the State will have to shoulder the costs, particularly during shocks.

The treatment of the two main groups of contingent liabilities requires different approaches. For example, with implicit contingent liabilities it is difficult—sometimes impossible—to define a maximum expected contingency, which usually exists whenever there is a rule (such as a law or a contract) to determine an explicit contingent liability. In other words, in these cases the probability that the State is really forced to intervene, and to what extent, has to be established ad hoc. It is obvious that, given their characteristics, implicit contingencies present a higher degree of complexity than explicit ones, both in conceptual terms and in terms of measurement.

To summarize, the crucial characteristic that enables differentiation between one type of contingent liability and another is whether or not an element exists that can determine the potential materialization of the liability ex ante. Hence, in the case of implicit contingencies, certain criteria must be established that limit the scope of contingent liabilities. In principle, there is broad international consensus that natural disasters should be considered as a kind of implicit contingent liability. Such disasters are particularly significant in LAC countries due to their high frequency and high costs, alongside contingent liabilities that derive from systemic financial crises.

Up to this point, the classification has only been able to distinguish between liabilities for which a formal predetermined commitment exists and for which the State's maximum exposure is known, against those in which there is no such formal commitment and for which the maximum exposure, in general, cannot be foreseen. For this second type, there is no element that can formalize ex ante the liability's potential existence and its consequent size. Within these two major types, however, distinct classes of liabilities can be identified according to the event that originated them (see Table 1).

Table 1. Classification of Contingent Liabilities

Contingent liabilities	Explicit	Implicit
Included in the toolkit	Legal claims Private sector guarantees Intra-public sector guarantees Guarantees to PPPs for infrastructure provision Deposit guarantees in the financial system Linked to sovereign funds	Natural disasters
Others	Pensions Conditional cash transfer programs	Systemic financial crises Pensions

Source: Authors' elaboration.

From the broad list presented in Table 1, the following subset of explicit contingent liabilities is included in the toolkit:

- a) **Contingent liabilities from legal claims (litigation activity).** They arise when the State and a third party differ in their interpretation of the obligations resulting from a law, a contract, etc., and the issue is settled in a court of law, whether local or international.
- b) **Contingent liabilities from private sector guarantees.** Granting of guarantees and other state securities for liabilities contracted by private sector agents with third parties (either resident or non-resident).
- c) **Contingent liabilities from intra-public sector guarantees.** They are normally granted by the central government to SOEs or to subnational governments.
- d) **Contingent liabilities from guarantees to PPPs for infrastructure development.** This category includes state guarantee schemes for infrastructure concession projects (roads, ports, airports, and so on), in which public intervention guarantees a certain level of income to the concessionaire (for example, a minimum level of traffic in the case of a toll road). In practice, these arrangements are usually called minimum revenue guarantees (MRGs).
- e) **Contingent liabilities from deposit guarantees in the financial system.** These are the explicit state guarantee schemes for depositors in the financial system. They comprise the contingent liabilities arising from the current regulatory framework, which generally establishes limitations on the deposits covered.
- f) **Contingent liabilities from events linked to sovereign funds.** This category includes contingent liabilities for which sovereign funds have been explicitly established.

Furthermore, among the implicit contingent liabilities listed in Table 1, the toolkit includes the following:

- g) **Contingent liabilities from natural disasters.** This is the implicit obligation of governments to address the economic, social, and infrastructure emergencies caused by natural disasters (earthquakes, floods, hurricanes, etc.).

3. Defining the Toolkit

The toolkit is a device that enables both explicit and implicit contingent liabilities to be identified, classified, measured, monitored, simulated according to different scenarios (e.g., subjected to sensitivity analysis through stress-test scenarios), and reported.

As an identification and classification tool, the toolkit provides a guide to the most significant contingent liabilities, providing a mechanism to analyze and elucidate which ones the State should consider in any given country.

Once the categories of contingent liabilities have been identified, measurement is carried out through specifically designed mathematical/statistical/logical models (see below for the models presented).

The main principles behind the design of the models were to maximize simplicity while minimizing loss of accuracy in the measurements. Simplification refers as much to information requirements (the lowest possible requirements) as to the way in which the outcomes are measured, although the emphasis is placed on the former.

Given that the estimates should be reviewed periodically and whenever there are significant changes to the parameters, whether general (such as changes to gross domestic product (GDP) or to the interest rate) or for certain types of liabilities or situations (e.g., following a court ruling during legal claims), this toolkit is useful for monitoring contingent liabilities. Consequently, it also seeks to facilitate the consideration of changes to the parameters in order to carry out stress-testing exercises and create alternative scenarios, an essential element of risk management.

As an exposure tool for stocks and flows, the toolkit presents outcomes both in the form of individual results for each contingent liability and aggregate results for each category (e.g., legal claims, guarantees to PPPs for infrastructure projects, private sector guarantees) or each group (explicit and implicit liabilities). The toolkit also presents year-on-year measurements for a 20 year period, revealing the contingent liabilities' expected flow and profile—given the selected parameters—the discounted stock (net present value, NPV), and the maximum exposure to which the State is liable (in the case of explicit contingent liabilities). These estimates are valued both in local currency and as a percentage of GDP of the country in question. They can also be presented in terms of U.S. dollars (USD) or another currency should this be deemed necessary, if, for example, the traditional public debt estimates are published in that particular monetary unit. These results, therefore, are designed to be presented in combination with traditional public debt stocks and flows, in stress-testing exercises, or in asset and liability tables if sovereign asset and liability management exercises are carried out.

The values presented in the toolkit correspond to: (i) the maximum exposure, when there is any; (ii) the liability's net present value; and (iii) the annual flows of the contingency for a period of 20 years (Table 2). These estimations are presented in absolute values (local currency units or USD²) and as a percentage of GDP for the year in which the estimation is made. After describing the general measurement criteria proposed in the toolkit, the following section presents how the measurements are made, adapting the aforesaid criterion to each of the categories included.

² In this case, the aim is to express contingent liabilities assumed in foreign currency, given that the corresponding contracts or guarantees are denominated in that currency. The results are presented in USD by way of example and for purposes of homogeneity.

Table 2. Toolkit: Presentation of Contingent Liability Estimations

CONTINGENT LIABILITIES			Maximum exposure	Contingent liability (NPV)	Annual payments (discounted)					
					2014	2015	2016	2033	
TOTAL	Local currency	Millions								
	USD									
EXPLICIT	Local currency									
	USD									
IMPLICIT	Local currency									
	USD									
TOTAL	Total									
	Local currency									
	USD									
	Total									
EXPLICIT	Local currency									
	USD									
IMPLICIT	Total									
	Local currency									
	USD									
	Total									
EXPLICIT CONTINGENT LIABILITIES				Maximum exposure	Contingent liability (NPV)	Annual payments (discounted)				
						2014	2015	2016	2033
TOTAL	Local currency									
	USD									
Legal claims	Local currency									
	USD									
Private sector guarantees	Local currency									
	USD									
Intra-public sector guarantees	Local currency									
	USD									
Guarantees to PPPs for infrastructure provision	Local currency									
	USD									
Deposit guarantees in the financial system	Local currency									
	USD									
Linked to sovereign funds	Local currency									
	USD									
TOTAL	Total									
	Local currency									
	USD									
	Total									
Legal claims	Local currency									
	USD									
Private sector guarantees	Total									
	Local currency									
	USD									
	Total									
Intra-public sector guarantees	Local currency									
	USD									
Guarantees to PPPs for infrastructure provision	Total									
	Local currency									
	USD									
	Total									
Deposit guarantees in the financial system	Local currency									
	USD									
Linked to sovereign funds	Total									
	Local currency									
	USD									
	Total									
IMPLICIT CONTINGENT LIABILITIES				Maximum exposure	Contingent liability (NPV)	Annual payments (discounted)				
						2014	2015	2016	2033
Natural disasters	Local currency	Millions								
	USD									
	Total									
	Local currency	% of GDP								
	USD									

Source: Authors' elaboration.

4. Measuring Contingent Liabilities: A General Approach

In general, the approach to measuring contingent liabilities in each category relies on the estimation of three parameters that, operating in combination, enable a measurement to be made:

- a) **Maximum exposure resulting from the contingent liability (ME_i)**. This is the maximum amount that would result from the worst-case scenario for the State (the maximum sentence in the case of a trial, total noncompliance by a third party in the case of a state guarantee or the face value of the guarantee, the most negative economic scenario in the case of a demand guarantee, and so on). Chile and New Zealand, for example, report their contingent liabilities from sovereign guarantees according to their maximum exposure (face value).³
- b) **Adjustment parameter (B_i)**. This parameter corrects the maximum exposure value to more realistic levels of possible liability consolidation. Its value is estimated according to historical experience, the liability's particular situation when the measurement is taken, and other elements of judgment. Its magnitude is between 0 and 1.
- c) **Probability of occurrence (P_{it})**. This factor of measurement seeks to determine the probability that the unexpected event that would convert the contingent liability into a certain liability occurs. It is difficult to establish a simple and defined methodology for calculating this parameter. Historical considerations and economic projections drafted by reputable institutions must be taken into account. Specific probabilistic models (such as climate change prediction models in the case of natural disasters), which might be either parametric or nonparametric (see Section 5), should also be considered.

These parameters are combined in the following expression:

$$NPVCL_i = \sum_{t=1}^n \frac{ME_i B_i P_{i,t}}{(1+r)^t}$$

³ There is no single way to measure the value of a guarantee. Alternatives to the face value include: (i) expected costs of the guarantee, which can be viewed as the maximum value of the loss at a confidence level of, for example, 50 percent; (ii) "unexpected" costs of the guarantee, in other words, the maximum that the government can lose at a confidence level of, for example, 95 to 99 percent ("flow of funds at risk"); or (iii) the market value of the guarantee (meaning the expected costs plus a risk premium). Face value is the simplest measurement and the most commonly reported, since other measurements require estimating the probability that the guarantee is executed.

Where:

NPVCL_i: net present value of the contingent liability i for a n-year period.

ME_i: maximum exposure of the contingent liability i.

B_i: adjustment parameter of the contingent liability i (0 < B_i ≤ 1).

P_{i,t}: probability of occurrence of event i during period t (0 ≤ P_{i,t} < 1).

r: discount rate.

The parameters can vary over time. This becomes significant when evaluating the impact of contingent liabilities using a pluriannual exercise that can be integrated with other estimates and borrowing and/or fiscal sustainability projections.

In particular, for the case of the probability of occurrence, it is assumed that:

$$P_{i,t} = P_i \alpha_{i,t}$$

where:

P_i: probability of occurrence of event i throughout a n-year period.

α_{i,t}: weighting factor for the probability of occurrence of event i during period t, with

$$\sum_{t=1}^n \alpha_{i,t} = 1.$$

Consequently, the general expression⁴ yields two different kinds of results: the present value of the contingent liability in terms of the flows, for each period, and in terms of stock, according to the following expressions:

$$NPVCL_{i,t} = \frac{ME_i B_i P_i \alpha_{i,t}}{(1+r)^t}$$

$$NPVCL_i = \sum_{t=1}^n \frac{ME_i B_i P_i \alpha_{i,t}}{(1+r)^t}$$

Taking this general framework as a starting point, a specific measurement methodology was defined for each category of contingent liability included in the toolkit. It attempted to use as a basis—and in compliance with the requirements of universality and homogeneity—the methodological developments already made and used in certain countries, preferably from the LAC region. Even though the measurement and reporting methodologies put into practice can have specific characteristics (peculiar to each country), they usually offer a good point of departure for constructing a more comprehensive and general scheme.

⁴ Although this expression might be simplified by extracting the sum of the parameters that did not vary over time, this was decided against to clearly express the concepts of stocks and flows. The same criterion is followed in the following sections.

The methodological decisions made to choose between the different ways of estimating the three aforementioned parameters (i.e., maximum exposure, the adjustment factor, and the probability of occurrence) and their distribution over time lead to a couple of dilemmas.

The first strikes a balance between sophistication and simplicity in measurement models. On the side of sophistication, adding an element of probability can lead to stochastic models and probabilistic methods for obtaining the best estimation for the values of each of the parameters. However, this path runs the risk of making the measurement excessively complex, which detracts from the toolkit's effectiveness as a device for general use. If necessary, simplification in this field can be achieved by using qualitative valuations for the probability of occurrence (for example, "high," "medium," or "low"), although at the risk of reducing the calculation's accuracy and rigorousness.

A second dilemma arises between the specificity and generality of the methodologies. Even though the generic categorization of contingent liabilities is applicable to all countries, the specific cases reveal idiosyncrasies peculiar to each jurisdiction. For example, the problem of claims against the State is general, but it has its peculiarities, normally associated with the organizational characteristics of the justice system in each country. Any methodology that aspires to respond precisely and specifically to the judicial process particular to a certain country will gain in explanatory power for that case, but will be difficult to apply in other countries with different specificities. At the other extreme, too generic an approach can affect the accuracy of the estimates.

Sections 5 to 11 present the contingent liabilities included in the toolkit. First, explicit liabilities are considered from: legal claims, private sector guarantees, intra-public sector guarantees, PPPs to finance infrastructure projects, deposit guarantees in the financial system, and those linked to sovereign funds. Thereafter, implicit contingent liabilities for natural disasters are examined. A brief conceptual description, the estimation methodology applied in the toolkit, a hypothetical case that serves as an example, and quantitative examples from a variety of countries are provided for each type of liability.

5. Contingent Liabilities from Legal Claims

Presentation

Contingent liabilities from legal claims arise from the possible occurrence of judgments against the State in legal claims or arbitration, which imply making payments to third parties.⁵ All ongoing claims against the State are included, and in whatever court (local or international) the claims are being processed. This category of liabilities is probably one of the simplest to identify. This does not mean, however, that it is the easiest to measure given the high subjectivity that might be involved in both the probabilities of occurrence (and their distribution over time) and the adjustment parameter. With regard to contingencies from legal claims, this parameter reflects the relationship between the probable amount of the sentence and the claim made in the courts.

Therefore, a case-by-case approach is adopted for estimating contingent liabilities from legal claims. This approach implies determining the amount of the claim (maximum exposure), identifying the probability of a judgment against the State, the expected duration of the trial, and estimating the sentence/claim ratio.

Estimation Model

The model used to estimate the contingent liability, adjusted year-on-year to obtain its present value, is the following:

$$NPVLC_i = \sum_{t=1}^n \frac{ME_i B_i P_i \alpha_{i,t}}{(1+r)^t}$$

Where:

$NPVLC_i$: net present value of the contingent liability that results from trial i.

ME_i : amount claimed corresponding to trial i (maximum exposure).⁶

B_i : expected ratio sentence/claim corresponding to trial i.

P_i : probability of a judgment against the State corresponding to trial i.

$\alpha_{i,t}$: weighting factor for the probability of a judgment against the State corresponding to trial i during period t, with $\sum_{t=1}^n \alpha_{i,t} = 1$.

In the base case, the probabilities of a judgment against the State are equally distributed among the years of expected duration of the litigation according to the lawyer's estimate (n

⁵ This treatment coincides with the approach taken in Colombia (Medium-Term Fiscal Framework).

⁶ For the sake of simplicity, the costs are not differentiated and are assumed to be included in this parameter.

years). This criterion may change, however, if more information becomes available (e.g., if a judgment is expected soon).

r : discount rate.

As previously mentioned, estimating the probability of a judgment against the State can often be complicated. Based on a stylization of the methodology applied in Colombia, these probabilities are estimated in the toolkit by combining objective historical data yielded by similar claims and the subjective appraisal of the lawyer intervening in each trial.

Therefore:

$$P = wp_o + (1 - w)p_s$$

where:

P : probability of an unfavorable judgment.

p_o : objective probability of an unfavorable judgment, where $p_o = (\text{unfavorable cases} + \text{arbitration}) / \text{possible cases}$.

The objective probabilities may be estimated in different ways. For example, using the methodology applied in Colombia, these estimates are made using a probability tree drawn up on the basis of resolved cases that might be similar to the case at hand (see below for a presentation of the hypothetical case).

w : weighting factor for the objective probability of an unfavorable judgment. In the base case it is assumed that w is fixed in time and is equal to 0.5, but it could be assigned the pertinent value as long as it is between zero and one. In the case that there are no objective data enabling an objective probability to be estimated, w takes the value zero.

p_s : subjective probability of an unfavorable judgment

$$p_s = 1 - (\gamma_1 \beta_1 + \gamma_2 \beta_2 + \gamma_3 \beta_3 + \gamma_4 \beta_4); \text{ with } \gamma_1 + \gamma_2 + \gamma_3 + \gamma_4 = 1$$

where:

β_i : qualitative criteria (four) that define the subjective probability. Its valuation, defined between zero and one, is provided by the lawyer.

These four criteria include, respectively, appraisals of: (i) strength of the defense's case (reasonableness and/or expectation of success based on the facts and the law upon which it is based); (ii) probative strength of the defense's case (consistency and strength of the facts versus the evidence); (iii) trial procedural hazards (such as removing the presiding judge, timely provision

of the evidence, number of instances, relief of court congestion); and (iv) level of jurisprudence (availability of similar legal precedents that are applicable to the case).⁷

γ_i : weighting factor for the probability of each qualitative criterion (in the base case, it is assumed that the γ_i are fixed in time and equal).

A Hypothetical Case

Suppose that there is a claim against the State by an energy distribution company whose contracts were unilaterally commandeered by the State, which then substitutes their denomination in foreign currency for local currency. As an initial measurement factor, the total amount of the claim presented by the company, for example, \$60 billion in local currency, is considered.⁸

ME = \$60 billion (2.2 percent of GDP).⁹

As in any other lawsuit, the claim will unquestionably establish a maximum scenario for measuring the economic harm caused to the company, using parameters and calculation assumptions that will probably not be accepted in their entirety by the court of arbitration. Therefore, based on similar past judgments, the legal team establishes an adjustment parameter for the amount claimed. Assume that an adjustment of 60 percent is defined:

B = 0.60

Bearing this in mind, on the one hand, objective historical data (outcomes of similar previous valid claims, according to the current legislation) and, on the other, the subjective valuation of the lawyer conducting the case, the probability of a judgment against the State is estimated using the methodology set out in Table 3.

⁷ The jurisprudence will only be valid if the legislation has not suffered any amendments concerning the matter in conflict.

⁸ With a view toward simplification, the example considers litigation in local currency, but the toolkit enables litigation in foreign currency to be estimated, as well as that taking place in international courts, such as the International Center for the Settlement of Investment Disputes (ICSID).

⁹ For this and the following hypothetical cases, it is assumed that GDP during the measurement period totals 2,700 billion in local currency.

Table 3. Estimation of the Objective Probabilities: Probability Tree – Number of Cases

First instance	Second instance	Extraordinary appeal	Final judgment	
8	4	2	1	UF
			1	F
			0	NA III/ UF II/ UF I
			1	UF
			0	F
			0	NA III/F II/ UF I
	3	1	1	NA II/ UF I
		1	1	UF
			0	F
			0	NA III/ UF II/ F I
			1	UF
			0	F
			0	NA III/ F II/ F I
		1	1	NA II/ F I
	1		1	ARB
Total unfavorable			6	
Total favorable			2	

Source: Authors' elaboration.

Notes: The red cells represent the unfavorable cases.

F: favorable judgment; UF: unfavorable judgment; ARB: arbitration (cases in which the claimant and the defendant reach an agreement. Arbitration is considered to be an unfavorable case for the State); NA: not appealed (cases that were not appealed by any of the parties after a judgment in the first or second instance); I, II, III: first, second and third instance, respectively.

Table 3 indicates that from a hypothetical total of eight already resolved legal claims that might in some way be useful as a reference for the case in hand, in the first instance four cases were unfavorable, three were favorable to the State, and the remaining one was resolved by arbitration. Then, in the second instance, of the four unfavorable judgments, two received an identical sentence, one turned out to be favorable, and one was not appealed. Of the three favorable judgments, one became unfavorable in the second instance. The final judgments (excluding those that previously went to arbitration) reveal five unfavorable cases. Therefore, of the eight original cases, one went to arbitration, one was favorable in the first instance and was not appealed, one was favorable in the decisive instance, one was unfavorable in the first instance and was not appealed, and four were unfavorable in the decisive instance, which means that six cases were unfavorable to the State. The results in terms of probabilities are shown below.

With regard to the objective probability:

X	Po(X)
F	0.25 (2/8)
UF	0.75 (6/8)

where X refers to the possible results of a legal claim:

Therefore, $p_o = 0.75$

Regarding the subjective probability:

Table 4. Estimation of the Subjective Probabilities

Qualitative criteria (lawyer's valuation)			
Strength of the defense's case	Probative strength of the defense's case	Trial procedural risks	Level of jurisprudence
0.5	0.5	0.5	0.5

Weighting factors (fixed)			
Y_1	Y_2	Y_3	Y_4
0.25	0.25	0.25	0.25

Therefore, $p_s = 0.5$

Estimation of the Total Probability

W	0.5
---	-----

Therefore,

$$P = 0.625$$

This example shows that the objective probabilities represent a much higher risk for the State (75 percent) than the legal team anticipates for the case in particular (50 percent). Consequently, the subjective probabilities substantially reduce (to 62.5 percent) the probability of an unfavorable judgment.

With these parameters, the valuation of the contingent liability at the moment of analysis would be:

$$LC_i = ME_i B_i P_i = \$60,000 \text{ M} \times 0.60 \times 0.625 = \$22,500 \text{ M}$$

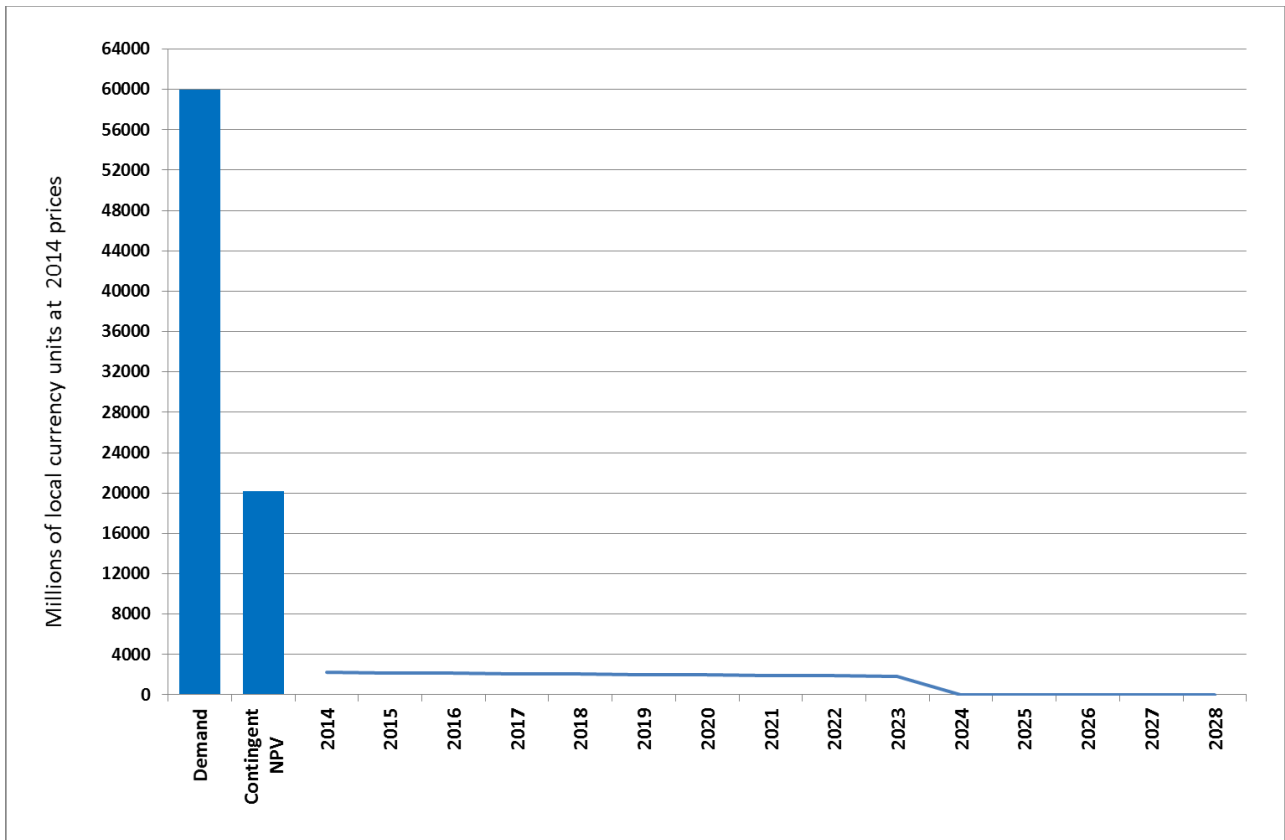
However, this figure must be discounted or, in other words, the corresponding value must be brought into the present from the period in which the judgment is expected to be rendered. If the lawyers estimate, for example, that the case will be resolved in an average of 10 years and they

are unable to assign distinct probabilities to each of those periods ($\alpha_{i,t}=1/10$), then the following expression applies:

$$NPVLC_i = \sum_{t=1}^n \frac{ME_i B_i P_i}{(1+r)^t}$$

If a real risk-free annual interest rate of 2 percent is supposed, then there is a contingent liability—valued today—of \$21,343 million in local currency, that is, almost 0.8 percent of GDP, considering a country with a 2,700 billion GDP measured in the local currency unit. Figure 1 shows the results of this hypothetical case, assuming that the probabilities of occurrence are equally distributed over the 10 years that the trial is expected to last.

Figure 1. Legal Claims: Value and Profile of the Contingent Liability



Source: Authors' elaboration.

International Experience

To understand the magnitude that these contingencies might represent, the cases of Colombia, Chile, and South Africa indicate the following. In Colombia, the present value of the contingency estimated from legal claims against the State for the period 2014–24 reaches COP \$116.6 billion

at constant prices for December 2012 (Ministry of Finance and Public Credit, 2014); this represents approximately 17.2 percent of GDP for 2013. By contrast, in Chile the contingent liability for this same category represents only 0.5 percent of GDP, while the maximum exposure to which the State is liable in this area is 7.2 percent of GDP (Budget Directorate, Ministry of Finance, 2015). In South Africa, for its part, it is estimated that contingent liabilities from legal claims reach ZAR 43.7 billion (National Treasury Department, 2014), equivalent to just over 1 percent of GDP.

6. Contingent Liabilities from Private Sector Guarantees

Presentation

This is a broad category, which encompasses the guarantees/counter guarantees/sureties that the State provides to the private sector. To a large extent, these are guarantees on loans that the financial sector provides to a wide range of borrowers, ranging from small and medium-sized enterprises to students taking out loans for higher education, according to the policies implemented in each country. Other guarantees include those for foreign trade or exchange rate coverage or for backing private investment.

Estimation Model

To estimate the contingent liabilities arising from private sector guarantees, the following factors are considered: the probability of the guarantee being executed in a certain period, the expected ratio between the executed guarantee and the contractual guarantee, and the guarantee's face value.¹⁰ The following model is employed for calculating the contingent liability in terms of present value:

$$NPVgpriv_i = \sum_{t=1}^n \frac{ME_i B_i P_i \alpha_{i,t}}{(1+r)^t}$$

Where:

$NPVgpriv_i$: net present value of the contingent liability resulting from contract i during the period stipulated in the contract (n years).

ME_i : face value of the guarantee i (maximum exposure).

¹⁰ Although the estimation model seeks to include all guarantees, an exception must be made regarding so-called one-off guarantees, for which it is difficult to estimate the probability of occurrence as comparable cases are hard to find. According to the European Union, one-off guarantees are defined as individual guarantees for which the guarantors are unable to make a reliable estimation of the probability of the guarantee being executed. One-off guarantees are normally linked to debt instruments (for example, loans and bonds).

B_i : expected ratio between executed guarantee/contractual guarantee for guarantee i . This relationship could be based on historical data from comparable cases.

P_i : probability of executing the guarantee i during the period stipulated in the contract.

Due to the lack of data, in general the probabilities are determined according to associated ranges (low, medium-low, medium, medium-high, high). However, if more information were available in each case, then specific probabilities could be assigned. These could be based, for example, on bank ratings, credit ratings, or share prices on the stock exchange if there were any.

$\alpha_{i,t}$: weighting factor for the probability of executing the guarantee i during period t .

By default, such probabilities are obtained by distributing the probabilities of guarantee executions equally throughout the years it is in force, although if sufficient information is available, this can be used to distribute the probabilities over time.

r : discount rate.

As previously mentioned, the general expression described above is used to estimate contingent liabilities from private sector guarantees. However, corrections might be made if the maximum exposure were to vary over time, for example, when linked to a loan subject to an interest rate.

Therefore,

$$NPVg_{priv_i} = \sum_{t=1}^n \frac{ME_{i,t} B_i P_i \alpha_{i,t}}{(1+r)^t}$$

where:

$ME_{i,t}$, the maximum exposure over time will have different behaviors depending on the type of loan contract. The toolkit envisages both the face value of the guarantee and the fixed installment alternative, linked to a French amortization system (although different alternatives might be included, such as the American amortization system in which the principal is repaid in its entirety when due).

In the French amortization system:

$$ME_{i,t} = C \frac{1 - (1 + k)^{t-j}}{k}$$

where:

k: real interest rate applied to the loan.

C: fixed payment for each period t.

j: number of total payments.

A Hypothetical Case

Suppose that the State, via the Ministry of Science and Technology, provides a guarantee to back a loan for investment in research and development in the amount of \$80 billion in local currency, to be repaid over 20 years. The maximum exposure to which the sovereign is exposed—equal to the face value of the guarantees—is therefore \$80 billion (3 percent of GDP). Moreover, based on comparable historical cases, an expected executed guarantee/contractual guarantee ratio of 0.7 is assigned. This indicates that, if the guarantees are exercised, the borrower expects to negotiate and repay only 70 percent of their face value. Moreover, it is assumed that the probability that the guarantee is used is 35 percent, which is equally distributed over the 20 years. The results indicate that the present value of the contingent liability, estimated with a real annual risk-free rate of 2 percent, is 16.024 billion in local currency, which represents 0.6 percent of GDP.

International Experience

Among the countries from which information has been obtained, the guarantees provided by the State to the private sector—excluding those linked to infrastructure projects via MRG contracts—range from a minimum of 0.7 percent of GDP in South Africa (National Treasury, Republic of South Africa, 2014) to 2 percent of GDP in Spain (Kingdom of Spain, 2014). Australia (Government of Australia, 2014), and Indonesia (Ministry of Finance of the Republic of Indonesia, 2014), with ratios of 1 percent and 1.3 percent of GDP, respectively, are in the intermediate range. In Chile, where only the guarantees linked to the Higher Education Loan (Crédito de Educación Superior) are reported, they represented 1 percent of GDP (Budget Directorate of the Ministry of Finance, 2015), although in this case this is the maximum exposure.

7. Contingent Liabilities from Intra-Public Sector Guarantees

Presentation

These are, in general, guarantees given by the central government to SOEs (or enterprises with State participation), autonomous agencies, or subnational governments. As in the case of private sector guarantees, they are often linked to loans contracted by these entities or with the issuance of debt.

Whether intra-public sector guarantees should be included as part of sovereign contingent debt depends on how broadly the public sector is defined. Thus, for example, there is no doubt that if only the central government or the general government is analyzed, comprising the central government and the social security institutions, in other words, following this paper's definition of the sovereign, then the contingent liabilities that the sovereign assumes by guaranteeing other public entities not covered by this definition must be included.

On the other hand, if the definition of the public sector is broad enough to include not only the central administration but also all other autonomous agencies (such as the central bank), SOEs, mixed public–private institutions (development funds, PPPs and so on), and subnational governments, including these guarantees might involve duplicating liabilities registered separately by each of these entities. However, a definition of documented debt that includes a broad public sector is not normally used, and it is common for the largest contingencies to be generated in the borderline areas of the public sector.

Furthermore, even if the public sector is defined broadly, it is still advisable to measure the contingent debt even though, after consolidating the registered debt and the contingent liabilities, some of the latter must not be included. This is because good risk management demands awareness of the existence of a surety or a guarantee, regardless of whether the debt is recorded elsewhere in the public sector. In any case, the way in which sovereign has been defined requires the toolkit to consider contingent liabilities for sovereign guarantees or sureties, including those to other public or semi-public institutions.

Estimation Model

The estimation methodology is analogous to that used for private sector guarantees (see Section 6 above).

$$NPV_{gpub_i} = \sum_{t=1}^n \frac{ME_{i,t} B_i P_i \alpha_{i,t}}{(1+r)^t}$$

The elements used to determine the parameters will differ according to the type of institution that receives the guarantee (such as enterprises or subnational governments). Thus, for example, in the case of state or local governments, existing bond ratings could be used to estimate the probability of occurrence of guarantee execution. In the case of SOEs, an existing bond issue might be available or, alternatively, credit risk evaluations by a private financial entity.

A Hypothetical Case

Assume that the national government explicitly guarantees to SOEs and subnational governments a total of \$400 billion in local currency, or 14.8 percent of GDP. The probability that such guarantees are executed could be deduced from the credit ratings of the enterprises and subnational governments involved, if available, or from other comparable agencies and/or entities. The adjustment parameter, an indicator of the magnitude in which the guarantees will be executed, can be calculated using historical data. If it is estimated that the probability of noncompliance is medium-high, for example 60 percent, distributed equally over the lifetime of the guarantees, and assuming that the adjustment parameter is 0.8, then, at a real annual discount rate of 2 percent, the present value of the contingent rises to \$86.233 billion in local currency, equivalent to 3.2 percent of GDP.

International Experience

Intra-public sector guarantees—basically to SOEs and subnational governments—are usually higher than those provided to the private sector (even in the case of Turkey where, according to official information, in the first quarter of 2014 they represented barely 0.6 percent of GDP) (Government of Turkey, 2014). In Chile, for example, their face value represents 1 percent of GDP, which corresponds in all cases to guarantees for borrowing by SOEs; in Pakistan, these guarantees account for 3 percent (Ministry of Finance, data from 31 March 2014); in Australia, 5 percent; and in South Africa, they rise to 10 percent.¹¹ However, the most complex case appears to be China, where, according to Zhang and Barnett (2014), contingent liabilities linked to subnational governments exceed 100 percent of GDP.

¹¹ The sources for Australia, Chile, and South Africa are the same as those mentioned in the previous sections.

8. Contingent Liabilities from Guarantees Related to Public–Private Partnerships for Infrastructure Development

Presentation

Infrastructure development can be financed and carried out in different ways: paid out of the treasury, privately, or by implementing PPPs. If the State does not intervene directly, or does so only partially, in many cases it assumes some of the risks by providing guarantees. These guarantees can be of various types and intended to address different risks. Therefore, for example, coverage during the construction period might be for geological, property, design, or environmental risks, or simply inability to repay a loan. In these cases, the treatment of the guarantees may be similar to that accorded to other private sector guarantees.

There are other contracts, normally associated with PPPs, in which the State guarantees the concessionaire a certain minimum revenue during the operation of the infrastructure. These are very common for building and operating highways and airports and, to a lesser extent, ports, irrigation and sewerage works, electricity supply networks, and hospitals.

According to these MRG arrangements—which have variable duration, although they are not generally for less than 10 years and frequently range between 20 and 30 years—the concessionaire collects the revenue generated from the use of the service, while the State guarantees a minimum income to the concessionaire should effective demand fail to reach the said minimum. In certain arrangements (such as in Chile), the concessionaire commits to paying the State whenever revenues exceed a certain level. Whereas the revenue guarantee generates a contingent liability for the State, the cases in which the concessionaire is obliged to share a part of earnings above a certain ceiling actually give rise to a sovereign contingent asset.

Contingent liability estimates arising from MRG contracts reveal that the amounts involved are not usually high, compared to others incurred to actually carry out the works. Obviously, there are other variables to consider, and it is very important to evaluate the characteristics of the contracts (a badly drafted contract, for example, can lead to noncompliance and, consequently, to implicit contingent liabilities).¹²

The liabilities resulting from MRGs can be estimated by means of simulation. Therefore, modeling these contracts in the toolkit implies drawing from the essential criteria of the general formula, albeit making changes to adapt the estimates to this type of exercise. Thus, for example, even though the concept of maximum exposure is not necessary for the estimates, it can be

¹² Renegotiating public works concessions constitutes a risk that can translate into high contingent liabilities, generally implicit (see, for example, Montesinos and Saavedra, 2012; Bitrán, Nieto-Parra, and Robledo, 2013).

identified as the situation, though extremely rare, in which demand is null (such as when no traffic circulates on the road).

Estimation Model

According to the usual methodology employed in LAC by countries such as Chile, Colombia, and Peru,¹³ a random motion (of the Brownian variety) is assumed for the traffic (or use) of roads, airports, and other infrastructure goods built and operated under these kinds of MRG regimes. A rate of growth is assumed for the volume of traffic (related to the expected growth of the economy), as well as a volatility value for that rate of growth (linked to the volatility of expected economic growth).

The cash flows received by the concessionaire are adjusted according to the implicit risk assumed by the investor (linked to the ratio of returns on the traffic flow or demand for the project and the return on the assets and the estimated risk premium, based on returns on the Stock Exchange General Index and a nominal risk-free rate). Thereafter, different demand trajectories can be generated using random numbers (bearing in mind that the correlation between shocks affects the flows of different concessions), thereby conducting the simulations and estimating the expected annual value of the flows of assets and liabilities in each project using a Monte Carlo simulation. Consequently, an estimation of the demand can be obtained using the following formula:

$$X_{i,t} = X_{i,t-1} \exp \left[(\mu_i - \beta(E[R_m - r])) - \frac{\sigma_i^2}{2} + \sigma_i Z_{i,t} \right]$$

where:

$X_{i,t}$: demand (traffic) in concession i during period t.

μ_i : expected rate of growth of demand in concession i (linked to economic growth).

σ_i : volatility of the growth of demand in concession i (linked to the volatility of economic growth).

β : ratio between the returns on traffic flow or project demand and the return on the assets.

$E[R_m - r]$: estimated risk premium based on the returns on the Stock Exchange General Index and a nominal risk-free rate.

¹³ See, for example, Ministry of Finance and Public Credit (2012); Risk Management Subdirectorate, Directorate General for Public Credit and National Treasury (Subdirección de Riesgo, Dirección General de Crédito Público y Tesoro Nacional) (2011); and the Directorate General for Economic and Social Affairs (Dirección General de Asuntos Económicos y Sociales), Ministry of Economy and Finances (2007).

$Z_{i,t}$: random shock matrix (normal standard distribution) correlated among all the concessions included.¹⁴

After estimating the demand, the procedure for measuring the contingent liability (and possible contingent asset) generated implies, in the first place, estimating the risk-adjusted cash flows (for the specific activity and in general) and thereafter discounting the average cash flow using a risk-free rate.

Contingent liabilities are therefore estimated, taking into account the expected fees. Fees are considered to be exogenous, although they might eventually be treated as processes subject to ad hoc regulatory interventions.

Given a minimum amount of guaranteed annual revenue (I_{\min}), a maximum annual amount of revenues stipulated in the contract (I_{\max}), and an estimated revenue (I), the State pays the private investor the amount ($I_{\min} - I$) if $I < I_{\min}$ or receives a percentage of revenue when $I > I_{\max}$. In the former case, the flow turns out to be a contingent liability for the State; in the latter, a contingent asset. Finally, the present value is obtained by discounting the flows using a risk-free interest rate. To summarize, the model used to estimate the contingent liability, adjusted for risk, in terms of present value is the following:

$$NPVMRG_i = \sum_{t=1}^n \frac{MRG_{i,t} - IE_{i,t}}{(1+r)^t}, \text{ if } MRG_{i,t} \geq IE_{i,t}; 0, \text{ in other case}$$

and

$$IE_{i,t} = f_{i,t} X_{i,t}$$

where:

$NPVMRG_i$: net present value of the contingent liability generated by the minimum revenue guarantee to project i , throughout a n -year period.

$MRG_{i,t}$: minimum revenue guaranteed to project i during period t .

$IE_{i,t}$: expected revenue from project i during period t .

$f_{i,t}$: expected fee for project i during period t .

$X_{i,t}$: demand (traffic) for concession i during period t , as defined and estimated above.

In short, the simulation exercises estimate revenues from MRG contracts using different values for the parameters of volatility of growth, the specific risk of the activity, and the risk

¹⁴ The shocks might be related, for example, to an economic crisis or to natural disasters that, in general, affect more than one PPP. Therefore, a matrix is proposed that takes the correlations between the effects into account.

premium for the economy. The outcomes reveal how the contingent liability varies according to the parameters chosen throughout a 20-year period, considering the possible links between the shocks that affect all of the concessions considered.

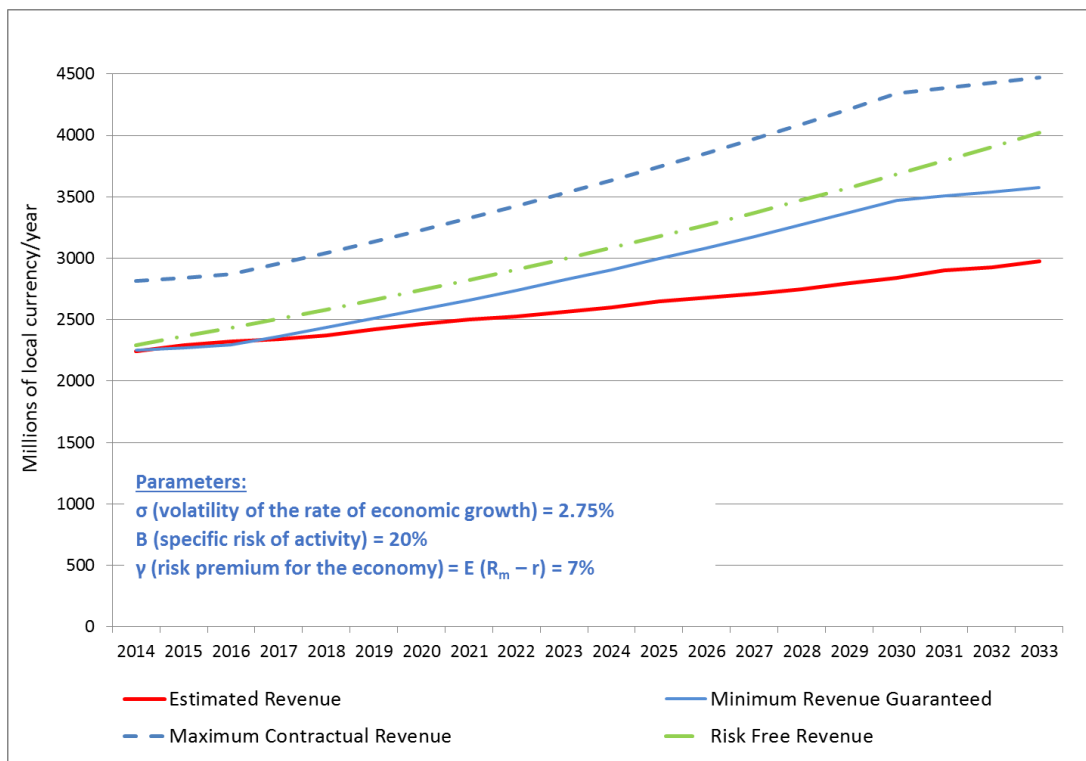
A Hypothetical Case

Suppose that in a highway construction project, the State guarantees to the concessionaire that a minimum of 616,438 cars per day will use the new road (equivalent to 450 million axles per year). If circulation exceeds 770,547 vehicles per day, then the concessionaire is obliged to pay the State 20 percent of the extraordinary revenues. The toll is 10 local currency units per automobile, while demand grows 3 percent annually. Based on these data, the estimated demand is ascertained in a risk-free scenario (risk-free revenue); in this example, over a period of 20 years.

Now assume that the volatility of economic growth (and of this specific demand) is 2.75 percent annually, the specific risks of the activity are 20 percent, and the risk premium for the economy is 7 percent. This is considered to be the base scenario (Figure 2). These parameters, alongside the random shocks, yield an estimated revenue that differs from the risk-free revenue.

Figure 2 also shows the minimum guaranteed revenue and the maximum above which the company pays a fraction of its income to the State. According to the assumptions, operating revenues are, except for the years 2015 and 2016, below the guaranteed minimums in every year, which means that, given the assumed parameters and a real annual discount rate of 2 percent, this project generates a contingent liability for the State. The maximum exposure is estimated at 46.45 billion in local currency units, equivalent to 1.7 percent of GDP, and the present value of the contingent liability at 5.583 billion in local currency units, which represents 0.2 percent of GDP.

Figure 2. Base Scenario



Source: Authors' elaboration.

International Experience

The official estimates for countries both inside and outside the LAC region indicate that exposures are, in general, low. In Chile (Budget Directorate, Ministry of Finance, 2015), for example, the contingent liability for MRG concessions reaches 0.1 percent of GDP when considering flows for the period 2014–36.¹⁵ The present value of the maximum exposure, however, rises to 2.5 percent of GDP. In South Africa, the contingent amounts involved reached ZAR 11 billion in December 2012 (National Treasury Department, 2014), equivalent to approximately 0.4 percent of GDP. In Ireland, they are even higher, amounting to EUR 2 billion or, in other words, 1 percent of GDP for 2011 (Hughes et al., 2013).

¹⁵ These flows are estimated excluding the revenues that exceed the maximum limit above which the concessionaire pays part of its income to the State.

9. Contingent Liabilities from Deposit Guarantees in the Financial System

Presentation

It is a common practice for States to guarantee a fraction of deposits in the financial system through insurance designed to protect savers should individual institutions experience problems (meaning that the guarantees do not have a systemic connotation). When well designed, these insurance policies do generate adequate incentives given that they prevent bank runs by protecting small deposit holders in the case of bank failures and, therefore, contribute to the stability of the financial system as a whole. But they can also generate contingent liabilities for the State. In general, the following factors need to be known before estimating explicit deposit guarantees: the total amount of the liabilities covered, the probability of a nonsystemic crisis, and an estimation of the total number of entities that would be affected should a crisis of this nature happen.

Estimation Model

In the toolkit, estimation of the contingent liabilities generated by deposit guarantees in the financial system follows a general approach that has similarities with the methodology used in Chile. This implies that the financial system is considered as a whole, so that guarantees are applied to the total amounts of the deposits of all natural or legal persons. Even though all deposits are protected, deposits are divided into two brackets to which different rules are applied according to the amount deposited. The first bracket comprises deposits of less than or equal to a maximum insured amount (D_{\max}); deposits above this amount are included in the second bracket.¹⁶

Sovereign contingent liabilities from deposit guarantees in the financial system therefore arise from two possible cases. The first is the coverage given to natural or legal persons with deposits less than or equal to the maximum insured amount. In this case, the State pays a percentage (set at 90 percent by default in the toolkit, but this parameter may be changed) of the liabilities to the persons with deposits below or equal to said sum. The estimation is made on the basis of two assumptions:

¹⁶ In the toolkit, the brackets have been arbitrarily set by default, and an insured maximum equivalent to US\$5,000 has therefore been chosen, following a criterion similar to that used in Chile or in Argentina.

- a) Average number of accounts per person in the financial system for each of the deposit brackets (by default, this number is one for the first bracket and two for the second one, although this can be adjusted in practice);
- b) Percentage of the affected persons with deposits of less than or equal to D_{\max} that make use of the guarantee (the default position in the toolkit uses 100 percent, although this parameter can also be adjusted for the estimations).

The second case refers to liabilities to those persons with deposits greater than the insured maximum. In each case, the State pays the maximum corresponding to the first bracket (using the assumptions established by default: 90 percent of D_{\max}), regardless of the amount of the deposits. Assumptions must also be made in this bracket about the average number of accounts per person in the financial system (two by default, as in the first bracket, but this is also adjustable) and about the percentage of affected persons with deposits greater than the guaranteed maximum who execute the guarantee. In the toolkit, 40 percent is assumed, since the remaining 60 percent prefer to take legal action, although, as in the previous case, this parameter can also be amended when making the estimates.

The following expression corresponds to the State's contingent liability for deposit guarantees in the financial system, bearing in mind the probability of occurrence of a non-systemic crisis, its potential scope, and the decisions made by affected persons (natural and legal) whether or not to execute the guarantee:

$$NPVgdepfs = \sum_{t=1}^n \frac{\omega D_1 O_1 BP \alpha_t}{(1+r)^t} + \sum_{t=1}^n \frac{\omega D_{\max} C_2 O_2 BP \alpha_t}{\phi (1+r)^t}$$

Where:

$NPVgdepfs$: net present value of the contingent liability resulting from the State guarantee for deposits in the financial system, throughout a n -year period.

D_{\max} : maximum deposit insured (US\$5,000 by default, but adjustable).

D_1 : total amount of the liabilities covered by the deposit insurance in the first bracket (deposits less than or equal to D_{\max}).

C_2 : total number of accounts in the financial system in the second bracket (deposits greater than D_{\max}).

ϕ : number of accounts per client in the financial system for the second bracket of deposits (in the toolkit $\phi=2$, although this can be adjusted).

ω : percentage of the liabilities that the State pays to persons with deposits up to the maximum insured ceiling (by default $\omega = 90\%$, but this can be adjusted).

O_i : percentage of persons with deposits in each bracket, who execute the State guarantee.
By default,

$$O_i = \begin{cases} 100\% & \text{if deposits} \leq D_{\max} \\ 40\% & \text{if deposits} > D_{\max} \end{cases},$$

although these are subject to amendment if necessary.

B: percentage of the financial system affected by the nonsystemic financial crisis.

P: probability of occurrence of a nonsystemic banking crisis throughout a n-year period.

α_t : weighting factor for the probability of occurrence of a nonsystemic banking crisis during period t, with $\sum_{t=1}^n \alpha_t = 1$.

Both the adjustment parameter (B) and the probability may be obtained from historical observations, if available, or from comparable experiences of other countries whose respective financial systems have similar characteristics.

r: discount rate.

A Hypothetical Case

The example assumes an economy in which the maximum amount of deposits insured for each natural or legal person is the equivalent of US\$5,000; the total amount of the liabilities in accounts with deposits of the equivalent of up to US\$5,000 is \$50 billion in local currency; and there is \$550 billion in local currency in accounts with deposits greater than the equivalent of US\$5,000. The number of accounts is 29 million in the first bracket and 5.5 million in the second.

It is also assumed that the probability of occurrence of a nonsystemic crisis in the financial system is 5 percent annually and that, should such an event occur, it would affect 20 percent of all financial entities.

If the aforementioned general parameters are applied, meaning that the average number of accounts per person for the second bracket of deposits is two, that 100 percent of those holding accounts below the limit equivalent to US\$5,000 make use of the guarantee and that among those with accounts that exceed the equivalent of US\$5,000, the aforesaid percentage reaches 40 percent, then—for a period of 20 years and at a real annual discount rate of 2 percent—the net present value of the contingent liability totals \$11,562 billion in local currency (approximately 0.3 percent of the total amount of deposits considered), or approximately 0.4 percent of GDP. The maximum exposure rises to 111.748 billion in local currency units, or 4.1 percent of GDP.

International Experience

The explicit contingent liabilities linked to the financial system —through deposit guarantee schemes— vary significantly from one case to the next. In Ireland, for example, they account for 45 percent of GDP (Cussen and Lucey, 2011) whereas in Chile, merely 1.3 percent (Budget Directorate, Ministry of Finance, 2015). It is crucial to remember that these examples exclude capitalization of entities, which became generalized following the financial crisis of 2008–09.¹⁷

10. Contingent Liabilities from Events Linked to Sovereign Funds¹⁸

Presentation

Some sovereign funds are a mechanism aimed at mitigating risks associated with sovereign contingent liabilities. In other words, they encourage saving during certain periods and thereafter use these resources whenever specific contingencies occur, mitigating risks and, for example, smoothing business cycle and/or fiscal expenditure fluctuations.

Establishing a sovereign fund specifically for this purpose implies recognition of the existence of the contingencies that such a fund is set up to address. Therefore, this category of contingent liabilities includes those for which sovereign funds have been established. These contingencies may originally be explicit, or they may be implicit contingencies that become explicit when the fund is constituted (for example, natural disasters in the case of Panama). They are therefore treated as such, as long as the conditions for the use of the fund's resources are clearly defined in its foundation charter. This is the case, for example, of the Savings Fund of Panama (Fondo de Ahorro de Panamá, or FAP). The FAP was created in 2012 as a long-term savings and stabilization mechanism for states of emergency and economic downturns. The FAP's contribution rule stipulates that all contributions by the Panama Canal Authority to the National Treasury that exceed 3.5 percent of nominal GDP for the current year (from fiscal year 2015 onward) are deposited into the FAP. The FAP's withdrawal rule stipulates that resources can only be used to tackle emergencies and economic downturns under the conditions established by the Social and Fiscal Responsibility Law (Ley de Responsabilidad Social Fiscal, or LRSF) and by the FAP Law itself, and that up to 0.5 percent of FAP assets can be used to cancel debt, whenever the resources accumulated in the fund amount to at least 5 percent of GDP.

The toolkit focuses on those funds designed to act as economic stabilizers during an economic crisis (such as an economic downturn, the fiscal impacts of plummeting export-commodity prices, and so on) or to cover emergencies (such as natural disasters). The analysis

¹⁷ See, for example, Eurostat (2014), Cussen and Lucey (2011), Hughes et al. (2013).

¹⁸ This section is based on Demaestri and Chiara (2015).

can be extended to include funds established for other purposes. This category of liabilities is relatively simple to identify, given that they derive from the sovereign funds' own charters. However, they can be difficult to measure given their characteristics: the associated contingencies may or may not be clearly defined, depending on how the conditions for using fund resources are specified in its foundation charter.

Therefore, since these sovereign funds are set up for specific purposes and with rules governing accumulation, administration, investment policies, and different uses according to each case and, in general, according to the characteristics of the contingencies they seek to cover, there is no single estimation methodology for the contingent liabilities covered by these funds. A methodology can be proposed, however, for a simplified model. Its estimation formula can be refined case by case according to the constitutional rules of each sovereign fund analyzed.

Estimation Model

The model focuses on identifying the explicit contingencies or those that become explicit when the fund is established. Thus, the contingent liabilities covered by a sovereign fund are estimated according to the amount of resources available to address the possible occurrence of the contingencies for which the fund was established.¹⁹

As in previous cases, the net present value of the contingent liability is defined using a base model. This model can be tailored according to the specific characteristics of the regulations governing each fund.

Based on an estimation of the available resources—which depends on the rules regarding resource accumulation and use that regulate the fund's operation—and by making assumptions about the number, timing, and magnitude of the events that trigger the use of its resources (for example, based on historical data), the proposed model can estimate the amount of accumulated resources expected to be used in each period. The net present value of the contingent liability from events linked to the sovereign fund under analysis, for a period of “n” years, is expressed as follows:

$$NPV_SWF_i = \sum_{t=1}^n \frac{U_{i,t}}{(1+r)^t}$$

where:

¹⁹ If an implicit contingency does occur, it is assumed that it will be addressed using other economic policies or actions, rather than resorting to the sovereign fund.

NPV_SWF_i: net present value of the contingent liability from events linked to the sovereign fund i for a n-year period.

U_{i,t}: amount of resources of sovereign fund i expected to be used during period t.

r: discount rate.

Rule governing the use of resources: should one of the events for which the sovereign fund under analysis was constituted occur, then the use of the fund's resources follows the following rule:

$$U_{i,t} = \begin{cases} \text{Min} [(AR_{i,t} - R_{\min,i,t}); (\delta \cdot GDP_t)] & \text{if } C_{j,t} > \delta \\ \text{Min} [(AR_{i,t} - R_{\min,i,t}); (C_{j,t} \cdot GDP_t)] & \text{if } C_{j,t} \leq \delta \end{cases}$$

where:

AR_{i,t}: amount of available resources in the sovereign fund i, during period t.

R_{min,i,t}: minimum amount of available resources that the sovereign fund i must maintain during period t (pre-established by the sovereign fund's foundation charter).

GDP_t: the economy's gross domestic product during period t.

δ: maximum permitted value of interventions using sovereign fund i resources in each period (value pre-established by the rules governing the use of the sovereign fund resources). For the sake of simplicity δ is assumed to be constant and is expressed as a percentage of GDP_t.

C_{j,t}: cost of event j that occurred in moment t. For the sake of simplicity C_{j,t} is expressed as a percentage of GDP_t.

Resource accumulation rule: sovereign funds have a projected inflow for the same period in which the covered contingencies are evaluated. As a result, the resources available to address a contingency vary according to the time elapsed and the use of the funds accumulated, according to the following expression:

$$AR_{i,t} = AR_{i,t-1}(1 + r_{inv} - c_{ma\ i,t-1}) - U_{i,t-1} + GDP_{t-1}(y - c_{o\ i,t-1})$$

where:

r_{inv}: annual rate of return on the investment of sovereign fund i resources (for the sake of simplicity, this is taken to be constant).

c_{ma i,t-1}: cost of managing sovereign fund i assets, during period t-1 (as a percentage of available resources during period t-1)

y: rate of accumulation of resources in sovereign fund i. This rate may be fixed (exogenous parameter, generally provided by the policymaker) or a function of a variable

(endogenous).²⁰ In principle, for the sake of simplicity, it is assumed that the rate of accumulation of available resources in sovereign fund i is constant (fixed percentage of GDP_{t-1}), but this criterion can be adjusted.

$c_{o\ i,t-1}$: operating costs of sovereign fund i , during period $t-1$ (as a percentage of GDP_{t-1}).

Once the net present value of the contingent liability from events linked to the sovereign fund has been obtained, the remaining indicator to estimate is the maximum exposure. According to the proposed base-case model, the maximum exposure of sovereign fund i for a period of “ n ” years is defined as the maximum amount of contingencies that could be covered by the fund’s resources in that period, given the available resources in the fund and the rules that regulate its use. In other words, the maximum exposure is obtained by assuming the worst-case scenario: that events that trigger the use of the fund’s resources occur every year and that these events are of such magnitude that they require the withdrawal of the maximum amount of resources permitted. Under this definition, the maximum exposure of sovereign fund i for a period of “ n ” years is expressed as follows:

$$ME_{i,(t:1,n)} = \sum_{t=1}^n \frac{U_{\max\ i,t}}{(1+r)^t}$$

where:

$ME_{i,(t:1,n)}$: maximum exposure of sovereign fund i for a n -year period, expressed in present value.

$U_{\max\ i,t}$: maximum amount of contingencies that could possibly be covered by sovereign fund i resources during period t . $U_{\max\ i,t}$, which is a function of the resources available in the fund and the restrictions that regulate their use, is calculated on the basis of the following expression:

$$U_{\max\ i,t} = \text{Min} \left[(AR_{i,t} - R_{\min\ i,t}) ; \delta \cdot GDP_t \right]$$

A Hypothetical Case

Assume that a sovereign fund is set up to cover contingencies deriving from the possible occurrence of a specific economic event (which can be termed event j) and that, at this point in time, it has accumulated resources equivalent to 3 percent of GDP (given a GDP of 2,700 billion in local currency units). Based on experience, for a period of 20 years it is supposed that two

²⁰ For example, this might depend on the price of a main export commodity (such as copper in the case of Chile’s Economic and Social Stabilization Fund), on the demand for a particular service (such as Panama’s FAP), or on an extraordinary GDP growth that exceeds the natural growth rate, among others.

events j occur (in this example, in years 5 and 15 of the period considered), each with a cost equivalent to 5 percent of GDP for that year.

The fund's rules of functioning stipulate that withdrawal of resources is triggered by the occurrence of event j , that the maximum value of the intervention using the fund's resources is 5 percent of GDP per year, and that the minimum amount of resources that must remain available in the sovereign fund is 3 percent of GDP for the current year. Moreover, an annual rate of accumulation in the sovereign fund equivalent to 1 percent of GDP is supposed.

For the period considered (20 years) and assuming a real annual discount rate of 2 percent, the net present value of the contingent liability and the maximum exposure rise to 272.787 and 526.231 billion in local currency units, respectively, representing 10.1 and 19.5 percent of GDP of the base year. Additionally, if a 3 percent real annual rate of GDP growth were assumed, the value of the assets that would be available in the fund at the end of the final period (in 20 years time) would amount to 9.6 percent of GDP for that year.

International Experience

As previously mentioned, certain sovereign funds are constituted with specific purposes and rules regarding resource accumulation and use that differ in each case. In Chile, for example, fiscal policy considers a cyclically adjusted budget, which establishes that the extraordinary cyclical fiscal revenues associated with a higher-than-average level of economic activity and a copper price higher than its long-term benchmark must be accumulated in the FEES, set up in 2006.²¹ This fund acts as a countercyclical fund, enabling the treasury to save during periods of economic expansion and to withdraw resources to finance possible fiscal deficits in periods of low activity and/or low copper prices, among others.²² At the end of 2014, on the basis of the resources available in the fund (Budget Directorate, Ministry of Finance, 2015), and following the approach put forward in this paper, the maximum amount of contingencies potentially covered by the FEES might be estimated as approximately 6.2 percent of GDP. In Panama, as of June 2013, the net present value of the contingent liabilities liable to be covered by the FAP, taken over a period of 10 years and discounting a real annual rate of 2 percent, equaled 3.3 percent of GDP (Moskovits, 2013).

²¹ Decree Law (Decreto con Fuerza de Ley) N° 1, December 2006.

²² For a more detailed description of how the FEES operates, see Demaestri, Piedrabuena, and Cordero (2014).

11. Contingent Liabilities from Natural Disasters

Presentation

Natural disasters generate economic costs as a consequence of the direct losses in human and physical capital as well as the financial costs associated with tackling the emergency, rehabilitation, reconstruction, and reduced or paralyzed economic activity. The public sector usually covers part of these costs, during both the emergency and the long-term recovery. As a result, an estimation of contingent liabilities from natural disasters seeks to help countries design and implement cost financing and risk transfer strategies to mitigate their costs (Collich et al., 2010).

A recent study for Latin America (UNISDR and OSSO Corporation, 2013) shows that the losses resulting from destroyed or damaged dwellings, as well as the sheer number of people affected, have been growing over time and expanding geographically. This is true both in the region in general and in each country in particular, and especially with respect to losses associated with extensive hydrometeorological hazards and climatic phenomena.

One measurement of the costs of natural disasters is the pure annual risk premium, usually calculated for extreme disasters. This premium reflects the investment or average annual savings that a country must make to cover the losses associated with future catastrophic events, which might occur over very prolonged periods of time (for example, between 100 and 500 years). It assumes that this amount is paid annually to an insurance company. This is not the contingent liability, although it can be an input for its estimation. In the case of Panama, this premium accounts for 0.19 percent of annual GDP, similar to the figure seen in Ecuador but below that of Honduras (0.31 percent) or Peru (0.47 percent), to name a few examples (see Cardona et al., 2010). Moreover, the highest costs are very often associated with small-scale but frequent disasters.

Estimation Model

Six categories of disasters are identified: floods, hurricanes, earthquakes, droughts, tsunamis, and fires. Each event is assigned a probability of occurrence and an intensity. The latter measurement is parallel to the adjustment parameter described in the general methodology. To simplify matters, the probabilities and the intensity are determined according to different scales.

According to its intensity, a disaster can be classified as mild (its cost is assumed to be between 0.0 and 0.5 percent of GDP), severe (between 0.5 and 1.5 percent of GDP), or

catastrophic (more than 1.5 percent of GDP).²³ The intensity of the disaster is estimated according to the percentage of the population affected and the extraordinary public expenditures made during the emergency (Collich et al., 2010).

The probabilities are identified as: low (2.5 percent), medium-low (5.0 percent), medium (10.0 percent), medium-high (20.0 percent), high (50.0 percent), and null (0.0 percent) when this type of phenomenon is not known to happen in the country under analysis.²⁴

The following is the model employed for estimating the contingent liability:

$$NPV_{natdis_i} = \sum_{t=1}^n \frac{P_{i,t} I_i GDP_t}{(1+r)^t}$$

where:

NPV_{natdis_i} : net present value of the contingent liability originated by disaster i , for a n -year period.

GDP_t : GDP of the country during period t (measured using prices taken from the base year of measurement).

I_i : intensity of disaster i .

$P_{i,t}$: probability of occurrence of disaster i during period t .

r : discount rate.

A Hypothetical Case

Assumptions for the hypothetical case are made upon the usual highly frequent cases of floods, hurricanes, and earthquakes in Central America and the Caribbean. In the first case, a high probability of occurrence (50 percent) has been assigned, but with relatively low effects (mild intensity, which implies a cost of 0.5 percent of GDP). In the case of hurricanes, severe intensity is assumed (between 0.5 percent and 1.5 percent of GDP) with a medium-low probability (5 percent). Finally, earthquakes have been rated with a medium-low probability of occurrence but with the assumption that should an event occur, the costs would be roughly similar to those associated with floods, or 0.5 percent of GDP, due to the relatively mild intensity.

For a period of 20 years, and after applying a real annual risk-free rate of 2 percent, the contingency reaches \$202.397 billion in local currency (7.5 percent of GDP), given a GDP of

²³ For the estimations, it is assumed that the disasters occur at the respective top limits of their intensity, in mild or severe cases; in the case of catastrophes, a cost of 5 percent of GDP is assumed.

²⁴ To estimate this contingency, it is not necessary to identify the probable event. There might, therefore, be a null probability of a natural catastrophe occurring.

\$2,700 billion for the year of measurement and an estimated real annual growth rate of 3 percent for the following 19 years.

International Experience

For various reasons, the contingencies associated with natural disasters are not usually measured. One reason, although probably not the main one, is that the costs tend to be extremely high. This is not necessarily due to major catastrophes with a very low probability of occurrence, but rather to small-medium, recurring disasters.

Estimates for Panama (Moskovits, 2013) indicate that the contingencies for natural disasters might be as high as 7 percent of GDP, whereas for Japan, according to Hagino and Sakuraba (2011), they represent 3 percent of GDP.

12. Results of Applying the Toolkit to Hypothetical Cases

The hypothetical exercises presented in the previous sections can provide examples of the costs that a simulated economy might face as a consequence of its contingent liabilities²⁵. This simulated economy, with a GDP of 2,700 billion in local currency and with an anticipated real annual growth rate of 3 percent throughout the entire projection period (2014–2033), faces contingent liabilities that amount to 22.8 percent of current GDP (see Table 5).

Of this total, approximately two-thirds (15.3 percent of GDP) correspond to explicit contingent liabilities. The maximum exposure (which only includes explicit liabilities given that this criterion cannot be used for implicit liabilities) represents 45.3 percent of GDP. In this hypothetical case, the ratio of explicit contingent liability to maximum exposure is around 34 percent, with the lower ratio corresponding, as is usually the case, to infrastructure guarantees via PPPs.

These exercises assume a real annual discount rate equal to 2 percent throughout the entire period. Moreover, the volatility of the growth rate is assumed to be 2.75 percent, whereas the risk premium of the economy reaches 7 percent.

²⁵ For a presentation of the specific results for each type of contingent liability, see the corresponding sections entitled “A Hypothetical Case,” in which each is described.

Table 5. Results of an Estimation Exercise for Contingent Liabilities in a Hypothetical Economy

CONTINGENT LIABILITIES	Unit	Maximum exposure	Contingent liability (NPV)
TOTAL	Millions, in local currency		615,929
EXPLICIT		1,224,429	413,532
IMPLICIT			202,397
TOTAL	% of GDP		22.8%
EXPLICIT		45.3%	15.3%
IMPLICIT			7.5%
EXPLICIT CONTINGENT LIABILITIES		Maximum exposure	Contingent liability (NPV)
TOTAL	Millions, in local currency	1,224,429	413,532
Legal claims		60,000	21,343
Private sector guarantees		80,000	16,024
Intra-public sector guarantees		400,000	86,233
Guarantees to PPPs for infrastructure		46,450	5,583
Guarantees for deposits in the financial system		111,748	11,562
Linked to sovereign funds		526,231	272,787
TOTAL	% of GDP	45.3%	15.3%
Legal claims		2.2%	0.8%
Private sector guarantees		3.0%	0.6%
Intra-public sector guarantees		14.8%	3.2%
Guarantees to PPPs for infrastructure		1.7%	0.2%
Guarantees for deposits in the financial system		4.1%	0.4%
Linked to sovereign funds		19.5%	10.1%
IMPLICIT CONTINGENT LIABILITIES		Maximum exposure	Contingent liability (NPV)
Natural disasters	Millions, in local currency		202,397
	% of GDP		7.5%

Source: Authors' elaboration.

Note: Since the exercise assumes that all contingencies are denominated in local currency, to simplify interpretation, the rows corresponding to contingencies denominated in foreign currency were eliminated.

13. Use of the Toolkit for Stress Testing

In view of the fact that contingent liability estimates are subject, to a greater or a lesser degree, to a behavioral hypothesis, alternative scenarios should be proposed for both the contingencies themselves and the general economic conditions of the economy or for specific parameters. In addition to estimating the contingent liabilities, the toolkit can be used to test the results under different economic conditions or changes to the specific parameters that affect the contracts and, consequently, the contingent liabilities' value.

According to macroeconomic variables and the specific parameters for each of the contingent liabilities identified in the preceding sections, the net present value of the contingent liabilities can generally be expressed as a function of the following variables:

$$NPVCL_i = f(GDP, y, R, r, k, X, \mu, \sigma, \beta, Z, B, P, \delta)$$

Furthermore, as previously mentioned, the parameters themselves are a function of other variables. In the case of legal claims, for example, the probabilities depend on the lawyer's opinion regarding the probable trial outcome and similar case histories. Likewise, the likely increase of traffic along a certain road depends on the expected behavior of the economy.

Altered values for the specific macroeconomic variables and/or parameters will thus lead to different scenarios, and the contingent liability estimates will yield different results, in terms of both flows and stocks. The toolkit can therefore be used for stress-testing exercises by making changes to all or some of the assumptions involved. In particular, it enables adjustments to be made to the assumptions about the general variables and parameters considered, either individually (one variable/parameter at a time) or in combination (more than one variable and/or parameter at a time). The effects of these changes on each of the contingent liabilities included in the toolkit, as well as on the total estimation of the contingent liabilities, can be observed.

Stress testing of this kind is an essential element of risk management. By way of example, the following section presents the outcomes of tests in which—starting from the base-case scenario presented in the previous section—changes are made to one variable or one parameter at a time. With regard to the general variables, two examples are presented: in the first, a change is introduced to the rate of GDP growth and, in the second, to the interest rate. Thereafter, the effect of changes in different parameters is analyzed using an example of minimum revenue guarantee contracts for financing the costs of infrastructure development via PPPs.

Stress Test Exercise 1: Change in the Rate of GDP Growth

In the first scenario, the economy—which still faces the same liabilities—grows at a real annual rate of six percent every year, rather than the 3 percent assumed in the hypothetical examples. These assumptions are very simple and probably do not stand up, but they are useful for modeling purposes and for revealing the differences, both aggregate and for each contingent liability in particular.

Table 6 shows the general outcomes of the two proposed scenarios. As expected, according to the proposed exercise, both the maximum exposure and the contingent liability

increase according to the rate of economic growth. The change in the maximum exposure is entirely attributable to the contingent liabilities linked to sovereign funds because, given the rules that define how these funds' resources can be accumulated and used, the maximum exposure relating to the existence of a sovereign fund is a positive function of the rate of GDP growth. If sovereign funds are excluded from the analysis, the maximum exposure would be the same regardless of the hypothesis of GDP growth considered.²⁶ Moreover, even though the total amount of the contingent liabilities varies, explicit and implicit liabilities do not vary in equal magnitude or proportion. The observed increase in the case of the explicit liabilities is a consequence of the combination of an increase in the liabilities generated by events linked to sovereign funds²⁷ and a decline in the liabilities incurred for minimum revenue guarantees (it is more likely that guaranteed revenues are fulfilled amid a higher growth scenario, as the contractual minimums are surpassed on more occasions). The rest of the explicit liabilities, whose parameters are not linked to GDP, do not change when this adjustment is made (see Table A.1 in the Annex). For their part, implicit contingent liabilities increase proportionately alongside GDP growth (see Table A.2 in the annex).

Table 6. Contingent Liabilities: Results of Alternative Scenarios for the GDP Growth Rate

CONTINGENT LIABILITIES		Real growth: 3% annual		Real growth: 6% annual	
		Maximum exposure	Contingent liability (NPV)	Maximum exposure	Contingent liability (NPV)
TOTAL	Millions in local currency		615,929		758,509
Explicit		1,224,429	413,532	1,335,499	486,490
Implicit			202,397		272,019
TOTAL	% of GDP		22.8%		28.1%
Explicit		45.3%	15.3%	49.5%	18.0%
Implicit			7.5%		10.1%

Source: Authors' elaboration.

²⁶ Table A.1 in the Annex presents details of the results for each type of contingent liability for the two proposed scenarios.

²⁷ The rules defined for the accumulation and utilization of the fund's resources establish, respectively, an accumulation of resources and a maximum intervention limit that rise alongside GDP growth.

Stress Test Exercise 2: Change in the Interest Rate

In all the previously proposed hypothetical examples, the real annual discount rate was 2 percent. Now suppose that, by way of example, this rises to 6 percent. If no other parameter changes, then clearly the present values of all contingent liabilities are reduced, and this occurs to a greater degree the further away in time that these liabilities are expected to materialize. Table A3 in the Annex shows the results for the different types of liabilities in each of the two scenarios and the comparison between the totals. Over the 20-year horizon considered, the estimated total of contingent liabilities is reduced from 22.8 percent to 16.1 percent of GDP or, in other words, by 6.7 percentage points of GDP. The contingent liability of the second scenario thereby represents approximately 70 percent of the liability corresponding to the base scenario.

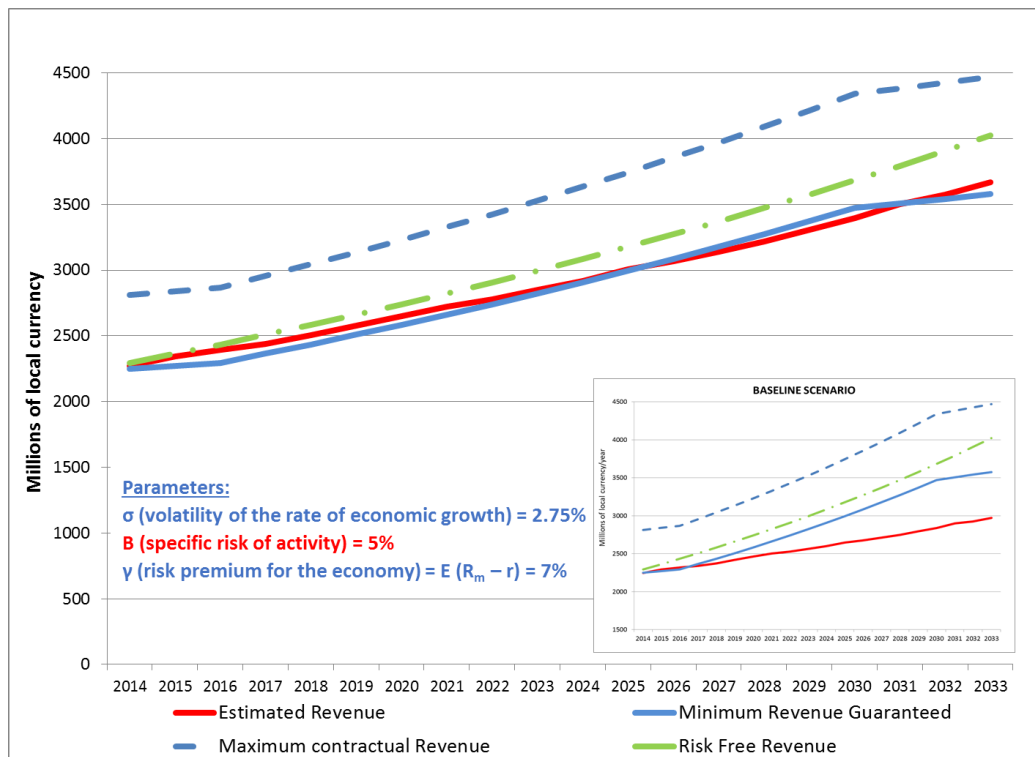
Stress Test Exercise 3: Changes to Specific Parameters. The Case of Financing Infrastructure Development using Minimum Revenue Guarantees

To illustrate the impact of modifying different parameters on contingent liabilities, the case of minimum revenue guarantee contracts to finance infrastructure development is used, since it allows changes to be made to more than one parameter. To simplify understanding of the exercise, the following parameters have been adjusted one at a time: specific risk of the activity (β), risk premium for the economy (γ), and volatility of the rate of economic growth (σ).

The example used is based on the hypothetical case previously put forward for contingent liabilities related to PPPs (see Section 8), which constitutes the base scenario for the stress test exercise presented below: a road project in which the State guarantees a minimum flow of traffic to the concessionaire of 616,438 cars per day. If traffic exceeds 770,547 vehicles per day, then the concessionaire is obliged to pay the State 20 percent of the extraordinary revenues. The toll is set at 5 local currency units per axle, while annual growth in demand reaches 3 percent annually. Moreover, the volatility of growth of the economy (and of this specific demand) is assumed to be 2.75 percent annually, the specific risks of the activity reach 20 percent, and the risk premium for the economy is 7 percent. In the base scenario, given the parameters considered, the project generates a contingent liability for the State whose net present value represents 0.2 percent of GDP of the base year.

First, the specific risk of the activity is adjusted by a reduction from 20 percent to 5 percent. In other words, this is a low-risk scenario for the activity (Figure 3).

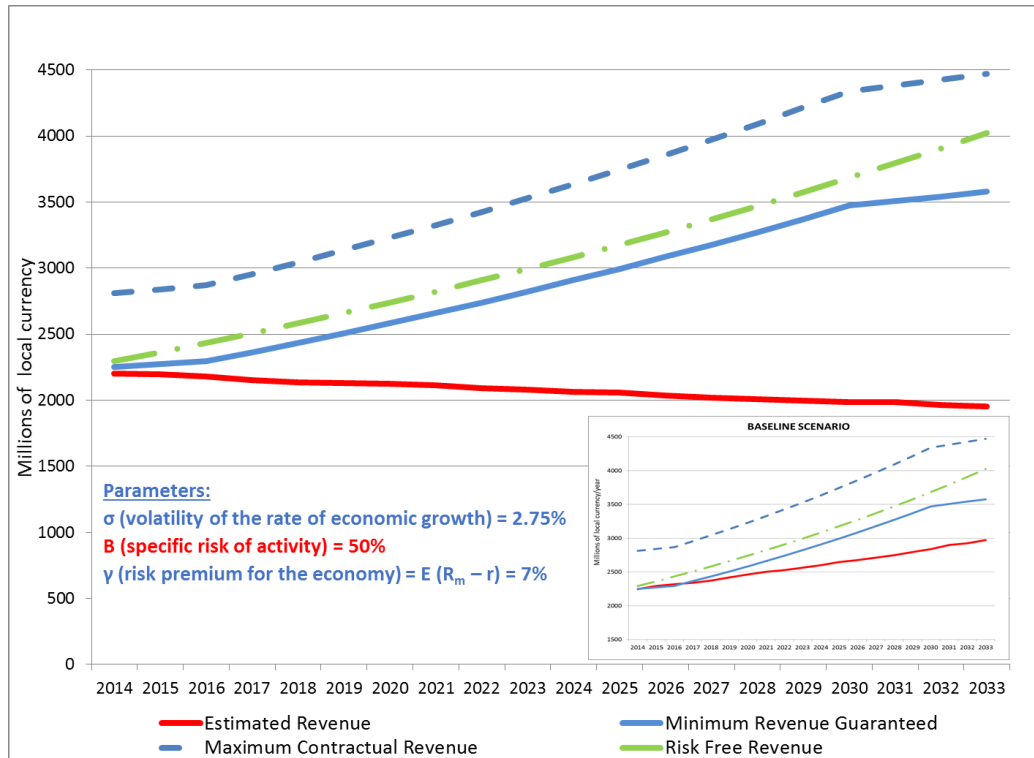
Figure 3. Low Risk of the Activity



Source: Authors' elaboration.

As might be expected, reducing the specific risk of the activity increases the expected revenues, situating them closer to risk-free revenues (revenues that are free of all risks, not just the risk specific to that activity) and, obviously, generates lower liabilities for the State. If the same parameter is modified (all others remaining constant), but in the opposite direction (vg. specific risk of the activity increases from 20 to 50 percent), the State must assume a higher contingent liability that starts as soon as the project is inaugurated, and that will continue increasing over time (see Figure 4).

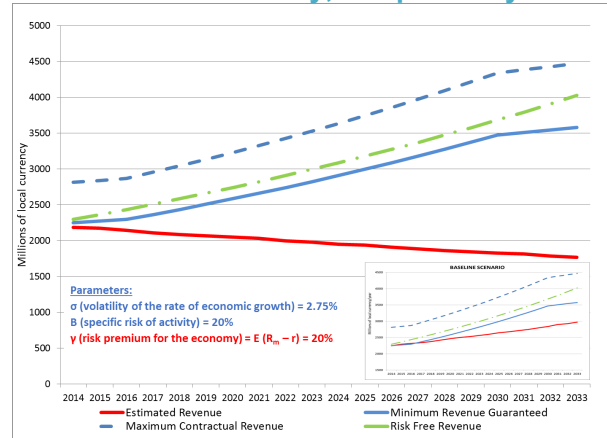
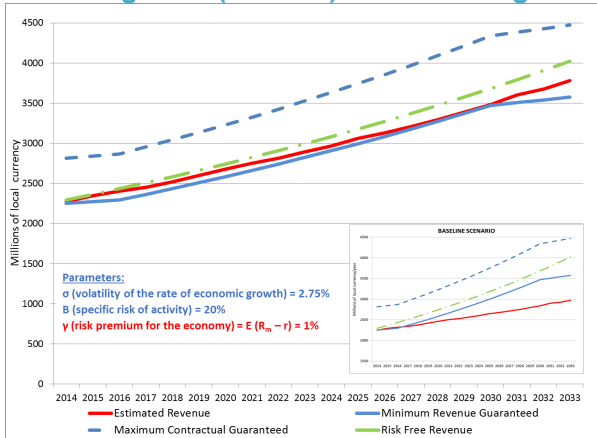
Figure 4. High Risk of the Activity



Source: Authors' elaboration.

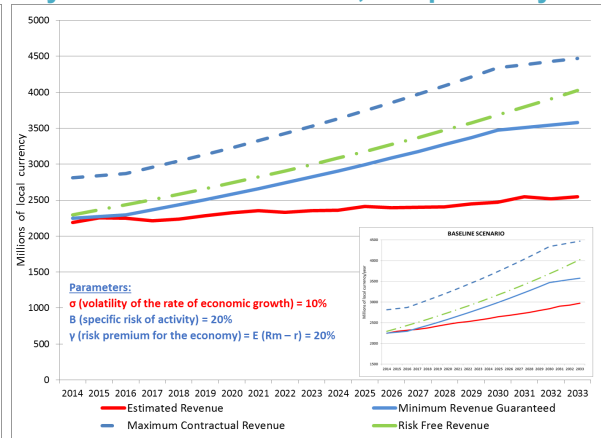
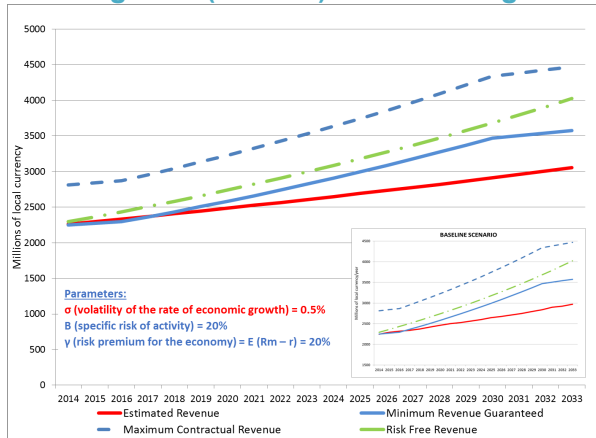
Figure 5 (a and b) and Figure 6 (a and b) show, on the one hand, the alternatives corresponding to low and high risk premiums of the economy and, on the other, the cases of low and high volatility of economic growth. As shown in Figure 5, while the low risk premium of the economy scenario leads to an absence of contingent liability for the State, the high risk premium scenario generates a contingent liability that increases over time. As for the impact of variations in the volatility of economic growth, Figure 6 shows that the sovereign contingent liability from minimum revenue guarantee contracts is a positive function of volatility of economic growth.

Figure 5 (a and b). Low and High Risk Premium for the Economy, Respectively



Source: Authors' elaboration.

Figure 6 (a and b). Low and High Volatility of Economic Growth, Respectively



Source: Authors' elaboration.

14. Conclusions

As this paper has shown, the toolkit can be used to define, classify, order, measure, monitor, and report sovereign contingent liabilities, both explicit and implicit, and to carry out stress testing. It is valid not just for stocks, but also for flows, which means it facilitates enhanced and better-informed management of sovereign liabilities and of macroeconomic decision making in general.

The toolkit's first contribution, therefore, is its potential for identifying contingent liabilities and measuring them using clear definitions and methodologies, which can be widely used and adapted to different situations and institutional circumstances. It is thus a dynamic toolkit, subject to review, which may be perfected and probably made more sophisticated with practice.

Presently, some countries make only partial estimates of their contingent liabilities. The list of the liabilities included is often variable, and they are not covered in their entirety. Moreover,

the classifications and methodologies applied are exceedingly heterogeneous, and are commonly either not clearly described or as yet unpublished. The use of this toolkit reveals, first, whether any liabilities have been left to one side. Second, it allows them to be measured. Likewise, by specifying the assumptions used for measurement, it leads to more transparent results and reveals the limitations that the latter may or may not have.

Being in a position to apply similar and transparent methodologies therefore constitutes a significant step forward from the current situation, and moreover facilitates comparisons based on the results obtained. In turn, this can help to provide early warning signs of economic stress.

In a similar vein, the knowledge gained from using the toolkit should permit—and lead to—better management of the risks and, consequently, of the liabilities and public borrowing in general, by encouraging more timely and less traumatic policy responses and thereby reducing undesirable collateral effects. This boosts confidence in the quality of fiscal management, can help define a more suitable institutional organization, improves the conditions for access to capital markets (both international and local), and reduces uncertainty for investors and taxpayers, which promotes a better business climate.

More specifically, being able to define and measure contingent liabilities in itself is a first step toward better liability management, including decision making on whether or not liabilities should be incurred. With regard to legal claims, for example, identifying the processes that recur most often and have the greatest potential fiscal impact can help to focus the efforts of the offices responsible for them and to design better strategies to reduce their effects. Likewise, with respect to guarantees in general, or to infrastructure contracts involving PPPs in particular, the toolkit increases awareness of the possible design problems faced by such guarantees or contracts, and can help to improve them over time. With regard to liabilities resulting from natural disasters, the toolkit offers the elements required to analyze whether the cost of prevention (by relocating the population, designing structures capable of withstanding disasters, and so on) is greater than bearing the economic costs after the event has occurred and mitigating them via sovereign funds and/or insurance policies.

In terms of debt management, identifying and monitoring contingent liabilities contributes: (i) to count with an early warning sign that can be used to improve scheduling of new debt issuance and repurchase; (ii) to define new instruments to cover future spending or mitigate risks; (iii) to improve financing strategy design, since the pricing of contingent liabilities has an impact on the corresponding registered debt; and (iv) to help reduce the incentives to seek financing via contingent liabilities. All of these contribute to mitigate risks and their effects. Mitigation should not only minimize the ex post cost; it should also envisage prevention.

Likewise, identifying and measuring the value of contingent liabilities is a necessary step toward integrated sovereign asset and liability management. The toolkit represents an indispensable device for this task.

It is worth highlighting that the version presented in this paper is the first edition of a dynamic toolkit that is open to continuous review and that can be perfected with practice, both regarding the estimation methodologies and the addition of new liabilities. In this respect, possible extensions to the toolkit might involve incorporating other explicit contingent liabilities, such as those that derive from the pension systems, as well as implicit liabilities incurred when systemic financial crises are tackled.

In many countries, pension systems are usually based on—or include—a component that guarantees a defined (or minimum) benefit to the covered population.²⁸ With increasing old age and system dependency ratios²⁹, it is often the case that the revenues generated by the system itself are insufficient to cover the guarantees and this, therefore, translates into contingent liabilities for the State. Actuarial analysis of the different systems is a prerequisite when estimating the contingent liabilities linked to the pension system.

Moreover, historical experience indicates that a general crisis in the financial system (or systemic crisis) that threatens economic stability triggers State intervention to protect the system's operation, payment mechanisms, as well as deposit holders and borrowers. The costs of these interventions can be extremely high (in August 2008, for example, the British Government announced a rescue package for the banks in the amount of US\$850 billion), and signify an exceedingly high transference of risks and increased public sector indebtedness. In a sample of 60 countries, the recent international financial crisis added around 10 percentage points, on average, to the debt-to-GDP ratio, while three-quarters of the countries in the same sample spent almost 20 percent of GDP (Laeven and Valencia, 2010). Even though this matter is still in the exploratory phase, it is envisaged that the toolkit could be extended to include the possibility of estimating these types of liabilities. In fact, an early version of the toolkit was tested using the macroeconomic approach of Bénassy-Quéré and Roussellet (2012), who made econometric estimates drawing on the aforesaid database and found out that the average cost of a systemic financial crisis can be as high as 14.3 percent of GDP. This approach is valuable

²⁸ Some defined contribution systems also often include a solidarity component that guarantees a minimum pension income.

²⁹ Old age dependency ratio: the ratio of older persons to working age individuals. System dependency ratio: the ratio of persons receiving pensions from a certain pension scheme divided by the number of workers contributing to the same scheme in the same period. (Source: WB Policy Research Report, 1994).

because of the information that it yields, although microeconomic approaches should also be evaluated.

Finally, it is important to emphasize that this version of the toolkit represents a significant first methodological effort. This establishes the bases for further progress in refining certain estimation methodologies that, in any case, should be addressed without losing sight of the fundamental idea that accuracy can be achieved without sacrificing simplicity.

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Annex

Table A.1. Explicit Contingent Liabilities: Outcomes of Alternative Scenarios for the Rate of GDP Growth

CONTINGENT LIABILITIES	Unit of measurement	Real growth: 3 percent annual		Real growth: 6 percent annual	
		Maximum exposure	Contingent liability (NPV)	Maximum exposure	Contingent liability (NPV)
Explicit contingencies		1,224,429	413,532	1,335,499	485,358
		45.3%	15.3%	49.5%	18.0%
Legal claims	Millions, in local currency	60,000	21,343	60,000	21,343
	% of GDP	2.2%	0.8%	2.2%	0.8%
Private sector guarantees	Millions, in local currency	80,000	16,024	80,000	16,024
	% of GDP	3.0%	0.6%	3.0%	0.6%
Intra-public sector guarantees	Millions, in local currency	400,000	86,233	400,000	86,233
	% of GDP	14.8%	3.2%	14.8%	3.2%
Guarantees to PPPs for infrastructure provision	Millions, in local currency	46,450	5,583	46,450	4
	% of GDP	1.7%	0.2%	1.7%	0.0%
Deposit guarantees in the financial system	Millions, in local currency	111,748	11,562	111,748	11,562
	% of GDP	4.1%	0.4%	4.1%	0.4%
Linked to sovereign funds	Millions, in local currency	526,231	272,787	637,301	351,324
	% of GDP	19.5%	10.1%	23.6%	13.0%

Source: Authors' elaboration.

Table A.2. Implicit Contingent Liabilities: Outcomes of Alternative Scenarios for the Rate of GDP Growth

IMPLICIT CONTINGENT LIABILITIES		Real growth: 3% annual	Real growth: 6% annual
		Contingent liability (NPV)	Contingent liability (NPV)
Natural disasters	Millions, in local currency	202,397	272,019
	% of GDP	7.5%	10.1%

Source: Authors' elaboration.

Table A.1. Contingent Liabilities: Results of Alternative Scenarios for the Discount Rate

a. Real discount rate: 2%	Unit of measurement	Contingent liability (NPV)	Expected discounted annual payments											
			2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	...	2033
TOTAL	Millions, in local currency	615,929	22,609	22,568	22,559	22,606	214,113	22,826	23,003	23,240	23,556	23,934	...	33,408
EXPLICIT		413,532	13,399	13,268	13,168	13,123	204,537	13,156	13,238	13,379	13,599	13,879	...	22,322
IMPLICIT		202,397	9,209	9,300	9,391	9,483	9,576	9,670	9,765	9,860	9,957	10,055	...	11,085
TOTAL	% of GDP	22.8%	0.8%	0.8%	0.8%	0.8%	8.0%	0.8%	0.9%	0.9%	0.9%	0.9%	...	1.2%
EXPLICIT		15.3%	0.5%	0.5%	0.5%	0.5%	7.6%	0.5%	0.5%	0.5%	0.5%	0.5%	...	0.8%
IMPLICIT		7.5%	0.3%	0.3%	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	...	0.4%

b. Real discount rate: 6%	Unit of measurement	Contingent liability (NPV)	Expected discounted annual payments											
			2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	...	2033
TOTAL	Millions, in local currency	433,997	21,756	20,897	20,100	19,386	115,633	18,140	17,602	17,126	16,725	16,373	...	15,479
EXPLICIT		297,211	12,894	12,286	11,733	11,256	107,733	10,463	10,142	9,877	9,682	9,529	...	10,343
IMPLICIT		136,786	8,862	8,611	8,367	8,131	7,900	7,677	7,460	7,248	7,043	6,844	...	5,136
TOTAL	% of GDP	16.1%	0.8%	0.8%	0.7%	0.7%	4.3%	0.7%	0.7%	0.6%	0.6%	0.6%	...	0.6%
EXPLICIT		11.0%	0.5%	0.5%	0.4%	0.4%	4.0%	0.4%	0.4%	0.4%	0.4%	0.4%	...	0.4%
IMPLICIT		5.1%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	...	0.2%

Differences (a) - (b)	Unit of measurement	Contingent liability (NPV)	Expected discounted annual payments											
			2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	...	2033
TOTAL	Millions, in local currency	181,932	853	1,671	2,459	3,220	98,480	4,686	5,401	6,114	6,831	7,561	...	17,929
	% of GDP	6.7%	0.0%	0.1%	0.1%	0.1%	3.6%	0.2%	0.2%	0.2%	0.3%	0.3%	...	0.7%

Source: Authors' elaboration.