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# Long-Term Debt Sustainability in Emerging Market Economies A Counterfactual Analysis

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# Long-Term Debt Sustainability in Emerging Market Economies

## A Counterfactual Analysis

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### Abstract

The 2015 Addis Ababa Action Agenda recognized the need for policies aimed at maintaining long-term debt sustainability. This paper describes a set of commonly used definitions of debt sustainability and shows that none of them focuses on long-term debt sustainability. It then discusses concept and several practical and conceptual difficulties linked to assessing solvency in developing and emerging countries. Next, the paper asks whether countries default because they borrow too much, or because investors think that they will default and this expectation becomes self-fulfilling. To answer this question, the paper uses a sample of 17 emerging market countries over 1970-2020 to build counterfactual debt levels under the assumption that these countries had continuous access to the international capital market without paying any premium over US Treasuries. The exercise shows that most debt crises are not driven by solvency issues.

**Keywords:** Public debt; Default; Liquidity crises
**JEL Codes:** F34; F32; H63

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## 1 Introduction

Sustainable economic growth and job creation require long-term investment in the assets, both physical and intangible, that promote structural change and expand productive capacity. Investment that generates private returns will, under certain conditions, be funded by private investors.[1] However, investment in local and global public goods requires public sector funds. The problem is that debt-financed public investment can lead to costly debt crises. With these considerations in mind, the 2015 Addis Ababa Action Agenda recognized the need for policies aimed at maintaining long-term debt sustainability (United Nations, 2015).

Long-term debt sustainability was a priority in 2015 because of the massive financing needs related to achieving the SDGs (for estimates see Castellani et al., 2019), upgrading infrastructure worldwide, and addressing climate change. Long-term debt sustainability is even more important now because the Covid pandemic has increased public debt worldwide and highlighted the importance of investing in global public goods and safety nets.[2]

But what is long-term debt sustainability? Public debt sustainability is not a well-defined concept (Wyplosz, 2011), the definition of long-term debt sustainability is even vaguer. The IMF Executive Board adopted the following definition of debt sustainability:

> In general terms, public debt can be regarded as sustainable when the primary balance needed to at least stabilize debt under both the baseline and realistic shock scenario is economically and politically feasible, such that the level of debt is consistent with an acceptably low rollover risk and with preserving potential growth at a satisfactory level. (IMF, 2021, p. 6)

This definition focuses on both solvency and liquidity. Thus, it is not appropriate for assessing long-term debt sustainability. In principle, long-term debt sustainability is related to the concept of solvency. A government is solvent if the present value of its future income stream is at least as large as the current level of debt plus the present value of future expenditure. Evaluating solvency is complicated by the fact that there is substantial uncertainty about future revenues and expenses.

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[1] For a discussion of the challenges linked to financing private sector long-term investment see Group of Thirty (2013).
[2] See Kose et al. (2017, 2020, 2021, 2022) and Gelpern and Panizza (2022).

Things are also complicated by the fact that the public sector issues different types of debt. The most important difference being between domestic currency debt and foreign currency debt (Eichengreen et al., 2005, 2007). While the sustainability of domestic currency debt is mostly driven by fiscal decisions, the sustainability of external debt involves complex interactions with overall external sustainability.

This paper starts by providing a definition of debt sustainability rooted in the academic literature. It then describes how debt sustainability is assessed by the main international financial institutions and credit rating agencies and shows that none of the commonly used approaches focuses on long-term sustainability. Next, the paper illustrates the practical and conceptual challenges linked to evaluating long-term debt sustainability by building counterfactual debt paths for a group of emerging market economies. This counterfactual exercise shows that most countries would have been solvent if they had continuous access to financing at a low rate.

## 2 Defining long-term debt sustainability

The starting point for analyzing debt suitability is the current period budget constraint:

$$D_t + M_t = (1 + i_{t-1})D_{t-1} + M_{t-1} + G_t - R_t \tag{1}$$

Where $D_t$ and $M_t$ measure end-of-period stocks of debt and monetary base, $i$ is the nominal interest rate paid on government debt, $G_t$ is government expenditure in goods and services, and $R_t$ denotes government revenues net of transfers.

Equation (1) shows that a given deficit can be financed by either issuing debt or by printing money. However, persistent money financing can have unpleasant consequences in terms of inflation and can only be used to service domestic currency debt (Kehoe, Nicolini and Sargent, 2021). It is thus useful to assume away money financing and write the current period budget constraint as:

$$D_t = (1 + i_{t-1})D_{t-1} + G_t - R_t \tag{2}$$

Equation (2) states that a country can satisfy its current period budget constraints as long as it can issue debt. Thus, the current period budget constraint focuses on liquidity and does not tell us much about long-term debt sustainability. Being able to issue debt is neither a sufficient nor a necessary condition for solvency.

It is not a sufficient condition because, if markets are myopic, countries can issue debt even when the situation is not sustainable. Moreover, in presence of market imperfections that lead to debt dilution (Bolton and Jeanne, 2009), countries might be able to issue debt even if everybody knows that the debt is not sustainable.

It is not a necessary condition because inability to issue debt might be dictated by global shocks and sentiments which are unrelated with domestic fundamentals. A country can face a liquidity crisis and become unable to rollover its debt even when it is fully solvent. For instance, the sudden stop that followed the Russian default of August 1998 prevented several fully solvent countries from accessing the international capital market (Calvo and Talvi, 2005).[3]

The concept of long-term debt sustainability is instead related to the intertemporal budget constraint which requires that the stock of debt does not surpass the present value of future budget balances. Formally:

$$D_t \leq \sum_{k=0}^{\infty} \frac{E_t(R_{t+k} - G_{t+k} - i_{t+k-1} D_{t+k-1})}{\prod_{j=1}^{k}\left(1 + E_t(\delta_{t+j})\right)} \tag{3}$$

Where $E_t$ denotes expectations taken at time $t$, $\delta$ is the time-varying discount rate, and all other variables are defined as above. Equation 3 requires that the present value of debt goes to zero as time goes to infinity. This a transversality condition (sometimes referred to as No-Ponzi Game Condition, NPG) can be formally written as:

$$\lim_{k \to \infty} \frac{D_k}{\prod_{1}^{k}(1 + E(\delta_k))} = 0 \tag{4}$$

Three considerations are now in order.

First, the transversality condition could be satisfied by defaulting on debt or by assuming implausible large future adjustments in revenues or expenditure. Long-term debt sustainably

[3] For a discussion of the cyclicality of international lending, see Galindo and Panizza (2018).

requires that the intertemporal budget constraint is satisfied without a radical change in policies or resorting to default.

Second, Equation (3) shows that assessing long-term debt sustainability is an incredibly complicated exercise (mission impossible according to Wyplosz, 2011) because it requires forming expectations about the future path of government expenditure and revenues. Moreover, debt sustainability depends on the path of the interest rate which, in turn, depends on the perception of debt sustainably. This latter factor can lead to multiple equilibria and self-fulfilling crises. If investors expect that debt is sustainable, they will be willing to lend at a low interest which, in turn, will increase the likelihood that the country can service its debt. If, instead, investors think that there are risks to debt sustainability, they will ask for higher interest rates to compensate for this risk. In doing so, they increase likelihood that debt will not be sustainable.

Third, assessing debt sustainability is particularly difficult in emerging market and developing economies which are subject to large real and financial shocks. The presence of external and foreign currency debt is an amplifying factor because the central bank is less able to act as lender of last resort when market financing dries up. Moreover, movements in the exchange rate have a large effect on the cost of debt service (Eichengreen et al. 2005, 2007). While equation (3) models long-term debt sustainability as a purely fiscal problem, in the presence of a large external debt a country may not be able to service its debt even if it runs a tight fiscal policy.

Using the intertemporal budget constraint as a measure of long-term debt sustainability clarifies that maintaining a sustainable debt situation does not necessarily prevent a government from running deficits for many years in a row. As the NPG condition restricts the asymptotic behavior of government debt, assessing solvency requires a long-term analysis.

Bohn (1991, 1998) develops a test of sustainability based on a fiscal reaction function in which the primary balance depends on past debt and shows that, as long the primary balance is positively affected by past debt level, the NPG condition will always be satisfied. Formally, debt sustainability requires $\rho > 0$ in:

$$pb_t = \rho d_{t-1} \tag{5}$$

To see that $\rho > 0$ is sufficient to satisfy the NPG, use the standard debt dynamic equation $\Delta d = -pb + (r-g)d_{t-1}$ and Equation (5) to write the debt-to-GDP ratio at time $t$ as $d_t = (1+r-g-\rho)d_{t-1}$ and then iterate forward to obtain the debt-to-GDP ratio at time $t+n$ as $d_{t+n} = (1+r-g-\rho)^n d_{t-1}$. The present value of this equation for $n$ that goes to infinite is given by:

$$\lim_{n\to\infty} d_{t-1}\left(\frac{1+r-g-\rho}{1+r}\right)^n \qquad (6)$$

Which will converge to zero as long as $\rho > 0$.[4]

With this framework, it is possible to assess long -run debt sustainability by estimating the fiscal reaction function of Equation 7 and testing whether the long-run value of $\rho$ is positive.

$$pb_t = \alpha + \rho d_{t-1} + u_t \qquad (7)$$

Bohn (1998) uses US data for the period 1916-1995 and finds evidence in supports the assumption that US debt is sustainable.

There are two challenges related to using Bohn's framework to evaluate long-term debt sustainability in emerging or developing economies. The first is practical—it is almost impossible to find an emerging economy with long data-series an no default history. The second is conceptual and has to do with the fact that $\rho$ is unlikely to be constant. Ghosh et al. (2013) suggest that $\rho$ is likely to be a function of the debt ratio and that there is a level of debt at which the response of the primary balance to higher debt becomes insufficient to stabilize the debt ratio. This is the country's debt limit—debt becomes unsustainable when this threshold is breached.[5] While Ghosh et al. (2013) focus on advanced economies, the role of debt limits is even more important in emerging and developing economies where interest rates are more sensitive to debt levels. Self-fulfilling crises like those described in Ghosh et al.'s (2013) stochastic model are thus more likely in emerging and developing economies.

[4] As $\frac{1+r-g-\rho}{1+r} = 1 - \frac{g+\rho}{1+r}$, I am also implicitly assuming that long run growth $g$ is non-negative.

[5] Gosh et al. (2013) build a deterministic model that assumes that interest rate remains constant and a more realistic stochastic model in which the interest rate depends on the probability of default. The implications of the two models are similar, but in the stochastic model both the risk premium and the default probability are endogenous and the debt limit is lower than in the deterministic model because countries are charged a risk premium that reflects the probability of default but also feeds into a higher probability of default. Defaults expectations can thus become self-fulfilling.

# 3 Debt sustainability assessment by the International Financial Institutions and Credit Rating Agencies

The IMF and the World Bank jointly developed a methodology for evaluating debt sustainability in low-income countries. China uses the same methodology for evaluating debt sustainability for countries that participate in the Belt and Road Initiative (BRI). The IMF recently published a revision of its methodology for evaluating debt sustainability in market access and advanced economies. Private sector credit rating agencies also have their own methodologies for assessing sovereign risk.

This section summarizes these different approaches to debt sustainability and shows that none of them is well suited to assessing debt long-term debt sustainability.[6]

## *3.1 The World Bank-IMF debt sustainability framework for Low-Income countries*

The IMF and the World Bank published the latest revisions of their debt sustainability framework (DSF) for low-income countries in September 2017 (IMF, 2017).

The DSF starts by building a composite indicator (CI) of debt carrying capacity. This indicator is a weighted average of the World Bank's index of the quality of policies and institutions ($CPIA$), GDP Growth ($GR$), the share of remittances over GDP ($REM$), international reserves over imports ($RES$), and world GDP growth ($WGR$).[7] The weights are defined as follows:

$$CI = 0.3.85 \times CPIA + 2.712 \times GR + 2.022 \times REM +$$
$$+4.052 \times RES - 3.99 \times RES^2 + 13.52 \times WGR$$

.

[6] This is not a criticism of these methodologies because none of them was designed with the objective to assess long-term sustainability.

[7] All variables are averaged over a ten-year period which includes 5 years of historical data and 5 years of projections from the IMF World Economic Outlook (WEO) dataset. As there are no projections for the CPIA, the DSF assumes that the CPIA value will remain constant over the five-year forecast period. The weights are obtained from a set of probit estimates of the determinants of debt distress. These estimates are a bit of a black box and the intuition for a squared term in reserves is not clear. The coefficients imply that the marginal effects of reserves on debt carrying capacity becomes negative when reserves surpass 50% of imports and the overall effect becomes negative when reserves surpass 100% of imports.

The $CI$ score is then used to classify countries into three debt carrying capacity groups (weak, medium and strong) and debt thresholds are established for each of these groups. The thresholds focus on the present value of public and publicly guaranteed (PPG) external debt and the present value of external PPG debt service (see Table 1).[8]

**Table 1: DSF Thresholds**

| Debt Carrying Capacity | PV of PPG Ext. Debt as % of | | PV of PPG Ext. debt service as % of | | PV total public debt as % of |
|---|---|---|---|---|---|
| | GDP | Exports | GDP | Exports | GDP |
| Weak (CI<2.69) | 30 | 140 | 10 | 14 | 35 |
| Medium (2.69<CI<3.05) | 40 | 180 | 15 | 18 | 55 |
| Strong (CI>3.05) | 55 | 240 | 21 | 23 | 70 |

Source: IMF (2017)

Risk ratings are then assigned by comparing the projected evolution of external debt at a ten-year horizon with these debt thresholds. If none of the thresholds is breached under both baseline projections and the most extreme stress tests, the country is classified as being at low risk of debt distress. A country is instead classified as being at moderate risk of debt distress if the thresholds are never breached under the baseline projections but at least one indicator breaches the threshold under the stress tests. Finally, a country is classified as being at high risk of debt distress if at least one indicator breaches the threshold in the baseline projections.

While the DSF tends to focus on external debt, it also includes a signal for the overall risk of public debt distress (see last column of Table 1). For countries with market access, the DSF also includes a market pressure signal based on sovereign spreads (the threshold is 570 basis points) and public gross financing needs (the threshold is 14% of GDP over the next three years). While the DSF relies on the mechanical signals described above, the framework also allows for using judgment to adjust the risk ratings, especially in the case of transitory or marginal breaches of the thresholds.[9]

The debt sustainability framework for countries that participate in the Belt and Road initiative is essentially identical to the World Bank-IMF DSF.[10] The two frameworks could, however, yield different results if analysists use different assumptions for the key macroeconomic variables that

[8] Present values are computed using a 5% discount rate.
[9] And discretion is sometimes applied on the basis of political considerations (Lang and Presbitero, 2018)
[10] There are a few small differences that do not seem very important (Morris and Plant, 2019).

are used as input. Note that while the DSF specifies that projections are based on WEO data, the BRI framework does not specify the source of macroeconomic projections.

### *3.2 The IMF debt sustainability framework for market access countries*

The IMF recently reviewed its debt sustainability framework for market access countries. The staff report presented to the Executive Board in January 2021 highlights several issues with the previous framework and suggests a methodology aimed at assessing risk of debt distress at 3 horizons: near term (1-2 year); medium term (5 years), and long-term (beyond five years).

The methodology concentrates on the evolution of total general government gross debt and it is based the definition of debt sustainability adopted by the IMF Executive Board.[11] Since it focuses on both solvency and liquidity requirements, it has been renamed "Sovereign Risk and Debt Sustainability Framework for market Access Countries" (SRDSF). According to IMF staff, there are two reasons for focusing on liquidity risk:

> First, in practice, a clear-cut distinction between solvency and liquidity risks is impossible, since borrowing costs and market access depend on (actual and perceived) solvency. Hence, any attempt to model uncertainty around the baseline debt path (e.g., in the form of a fanchart) must account for liquidity risks. Second, the IMF's lending framework uses debt sustainability as an indicator of the capacity of the member to repay the Fund. The latter could be impaired not just by insolvency but also by lack of liquidity, particularly if this is persistent. (IMF, 2021, P6)

The near-term component of SRDSF is based on a logit model which includes 10 variables aimed at capturing institutional quality, stress history, cyclical and global factors, and debt burden and buffer elements. SRDSF uses the same three risk categories of the low-income countries DSF (low, moderate, and high risk of debt distress) and the thresholds are chosen so that there is a 10% probability that countries that go into debt distress are classified as low risk—symmetrically, there is a 10% probability that countries that do not go into debt distress are classified as being at high risk (see Table 2).[12] The probability of debt distress for a country classified to be at low risk is 2% and the probability of debt distress for a high-risk country is 60%.

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[11] When the Review was discussed at the IMF Executive Board, several directors highlighted the need to consider public sector assets and also focus on net debt.

[12] The probability of classifying a country that does go into debt distress as being at moderate risk is about one-third.

**Table 2: SRDSF Near-term risk classification and probability of debt distress**

| | |
|---|---|
| Probability of classifying an actual crisis as a situation of low risk of debt distress (missed crisis) | 11% |
| Probability of classifying an actual crisis as a situation of moderate risk of debt distress (missed crisis) | 34% |
| Probability of classifying a tranquil period as a situation of high risk of debt distress (false alarm) | 9% |
| Probability of crisis conditional on being classified at low risk | 2% |
| Probability of crisis conditional on being classified at moderate risk | 16% |
| Probability of crisis conditional on being classified at high risk | 40% |

Source: IMF (2021), Box 3

The medium-term component of SRDSF also classifies countries in three group, with probabilities which are essentially identical to those of the near-term component. Medium-term risk assessment is based on three modules: (i) a fan chart aimed at assessing whether debt will stabilize with high probability; (ii) an analysis of gross financing needs aimed at assessing rollover risk; and (iii) a series of country-specific stress tests.[13]

At this stage, the IMF does not provide a detailed description of the long-term component of its debt sustainability framework for market access countries. However, it states that this component will include a set of optional modules aimed at closing an important gap in the existing framework (which offers no analytical tool beyond the 5-year horizon) and that staff will be provided with guidance on how to extend projections to a 10-year horizon. The long-term component is also expected to include an analysis of the long-run public finance consequences of climate change. The review states that:

> … global warming and rising sea-levels will have gradual and, cumulatively, much more profound effects over the long-term, A few countries might face existential threats and the need to rethink their economic models; others may need to undertake substantial spending for adaptation (e.g., changing crop varieties and building higher dikes to guard against sea levels) and mitigation. (IMF, 2021 p. 37).

The review suggests that in order to assess risk from long-term factors, IMF staff should discuss the impact of climate change on potential growth and government expenditure and draw out 30-

[13] The GFN thresholds are country-specific because countries with a large and stable investor base are able to rollover larger amount of debt.

year implications for the evolution of public debt. It is not clear if the framework will make allowance for increases in debt ratios aimed at financing investments that could mitigate these negative effects of climate change and consider the possibility that financing of climate friendly investment could be supported by special facilities which carry lower interest rates or rollover risk.

## 3.3 Credit Rating Agencies[14]

Until the early 1990s few emerging and developing economies had a sovereign rating. Now more than 90 EMDEs receive a rating by at last one of the three major rating agencies (Standard & Poor's, Moody's and Fitch).

These agencies provide opinions on sovereign risk by using a mix of quantitative and qualitative judgments aimed at capturing a sovereign's capacity and willingness to meet its debt obligations. Credit rating agencies do not express their rating opinions with numerical scores that can be directly interpreted as probability of default. Ratings are instead communicated with alphanumeric scores that range between AAA (the highest rating) and D/SD (meaning that a country is in default) for Standard & Poor's and Fitch and between Aaa and C for Moody's. There are usually twenty notches with the top ten being referred as investment grade.[15]

While rating agencies also issue short-term and local currency ratings, I focus on long-term foreign currency ratings which are normally used as baseline for local currency ratings. Although the rating focuses on long-term debt, the horizon of analysis tends to be short. Specifically, credit risk is usually assessed using 3-year projections for the main variables that are used as input for the rating decisions (Griffith Jones, and Kraemer, 2021).

### *Standard & Poor's*

Standard & Poor's sovereign analysis is based on five components (Standard & Poor's, 2014): (i) Institutional assessment; (ii) Economic assessment; (iii) External assessment; (iv) Fiscal assessment; and (v) Monetary assessment.

[14] This subsection is based on Panizza (2017).
[15] Being classified as investment grade has important implications because some institutional investors can only hold bonds issued by investment grade rated issuers.

As a first step, Standard & Poor's analysts assign a numerical score to each factor, which is then validated by the Rating Committee. These scores, which range between 1 (strongest) and 6 (weakest), are based on a series of quantitative and qualitative criteria specified in the rating methodology. In the next step, the scores of the institutional and economic assessments are averaged to form the institutional and economic profile. Similarly, the external, fiscal, and monetary assessment scores are averaged to form the flexibility and performance profile. An indicative rating level is then obtained from a table that maps the scores of the two profiles into credit rating levels.

In the final step, the Rating Committee decides whether the indicative rating should be adjusted based on factors that are not fully captured in the credit scoring process described above. Absent exceptional factors, the final rating will be within one notch of the indicative rating produced by the table.

*Moody's*

Moody's rating methodology is divided into four broad rating factors which then comprise 14 subfactors and more than 30 specific indicators. The four main factors are: (i) economic strength; (ii) institutional strength; (iii) fiscal strength; and (iv) susceptibility to event risk.

There are several steps in the rating methodology. Moody's analysts start by using the subfactors to score each main factor on a 0–100 scale. This numerical scale is then translated into a qualitative scale that consists of 14 strength categories (from VL-, very low minus, to VH+, very high plus). Next, analysts use a table to combine the economic strength and institutional strength assessments into an economic resiliency assessment. In the third step, the economic resiliency assessment is combined with the fiscal strength assessment to form the government financial strength assessment. Finally, the alpha-numeric rating is obtained by using a table that combines the government financial strength assessment with the event risk assessment.

To assign scores to the individual factors, Moody's analysts start with quantitative indicators with preassigned weights and then use a qualitative analysis to adjust the score by a maximum of 6 points.

*Fitch*

At Fitch, the rating process consists of three steps that use a combination of a quantitative model (the Sovereign Rating Model, or SRM, which includes 18 indicators grouped into four analytical pillars) and a series of qualitative judgments (Fitch, 2016).

In the first step, Fitch analysts use the quantitative model to determine a preliminary score for each of the four analytical pillars. This step is based on a predefined list of variables and weights. The second step consists of adjusting each of the four preliminary scores with a qualitative overlay which is designated to control for factors that are not fully captured by the quantitative indicators included in the SRM. This adjustment can potentially modify the score of each pillar by +2/–2 notches. However, the overall maximum adjustment relative to the total SRM score is capped at +3/–3 notches. Therefore, the methodology does not allow applying the maximum adjustment to each of the analytical pillars. In the third step, the scores of the four analytical pillars are added to a total score that determines the rating.

## 4 Imagine there is no spread

The previous sections show that there is no well-developed framework for assessing long-term sustainability. There are two reasons for the lack of such a framework.

The first reason is practical. Any debt sustainability analysis is only as good as the projections on which it is built. Assessing long-term debt sustainability requires long-term forecasts for several macroeconomic variables and these forecasts tend to be highly imprecise. In Panizza (2015), I use a simple exercise to evaluate the out-of-sample performance of the historical forecasting procedure suggested in the Low-Income country DSF template. Focusing on GDP growth, I find massive forecast errors and conclude that the framework is a very imprecise crystal ball for predicting sovereign debt crises.[16]

The second reason has to do with the link between liquidity and solvency. In the presence of multiple equilibria, liquidity crises can lead to solvency crises. Hence, it is difficult to separate solvency from liquidity crises, A way to address this issue is to build a counterfactual world in which liquidity crises are ruled out. This is what I try to do in this section. I look at a sample of

[16] The fact that the DSF focuses on the present value of debt adds another layer of complications related to the choice of the discount rate.

emerging market countries over 1970-2020 and ask the following question: what would debt levels in emerging market countries be if all countries had continuous access to the international capital market at low rates. I use this counterfactual debt level to study whether countries default because they borrow too much, or because investors think that they will default and this expectation becomes self-fulfilling.

To provide an answer to these questions, I use actual cash flows to selected emerging market economies to estimate actual internal rates of return and counterfactual internal rate of returns and debt levels under the assumptions that these countries: (i) always honor their debts; (ii) never lose full access to the international capital market; and (iii) do not pay a premium over US Treasuries.

To illustrate the methodology, I will start by describing the situation of two fictional countries and follow them over a 50-year period (1970-2020). I will then move to real world data.

### *4.1 An example*

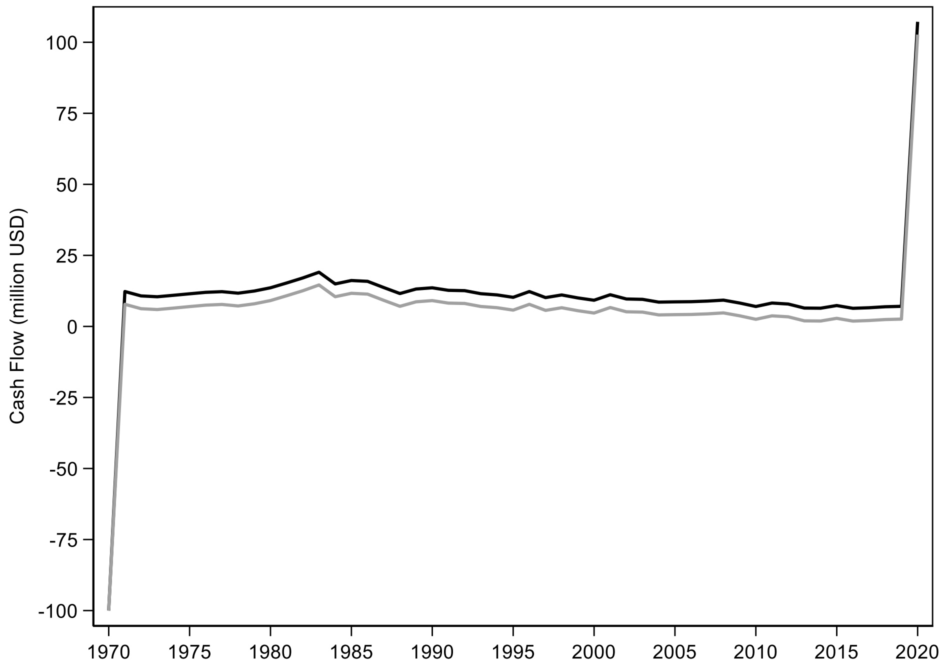
Consider two countries: A (always pay) and D (default) that start in 1970 with an initial level of debt of $100 million. Each year, the countries pay interests on the outstanding stock of debt and rollover the principal. Following Uribe and Schmitt-Grohé (2017), I assume that these countries face a spread of 450 basis points over US Treasuries. The only difference between the two countries is that A never defaults and D defaults with a 100% haircut. I assume that the default takes place in year 2000.

The solid black line in Figure 1 plots the cash flow (from the lender's point of view) related to lending to country A. In 1970, there is an initial disbursement of 100 million, then each year the country pays interest on 100. For instance, in 1971 the country pays $12.29 million (the US rate in 1970 was 7.79%+4.5% spread), in 1972 10.74 and so on, until 2020, when the country pays interest and the principal ($107 million, in this example). The gray solid line shows what it would have happened if the country had paid the US interest rate. Given our assumption on the spread and the initial loans, the gray line is always below the black line and the difference is $4.5 million. We can also compute the internal rate of return (IRR) for these two cash flows. We obtain that the actual IRR is 12.3% and the IRR based on the US interest rate is 7.8%, a 4.5 percentage points difference, as expected.

**Figure 1**

**Actual and counterfactual cash flow (country A)**

The solid black line plots the actual cash flow of country A and the solid gray line plots the cash flow under the assumption of no spread



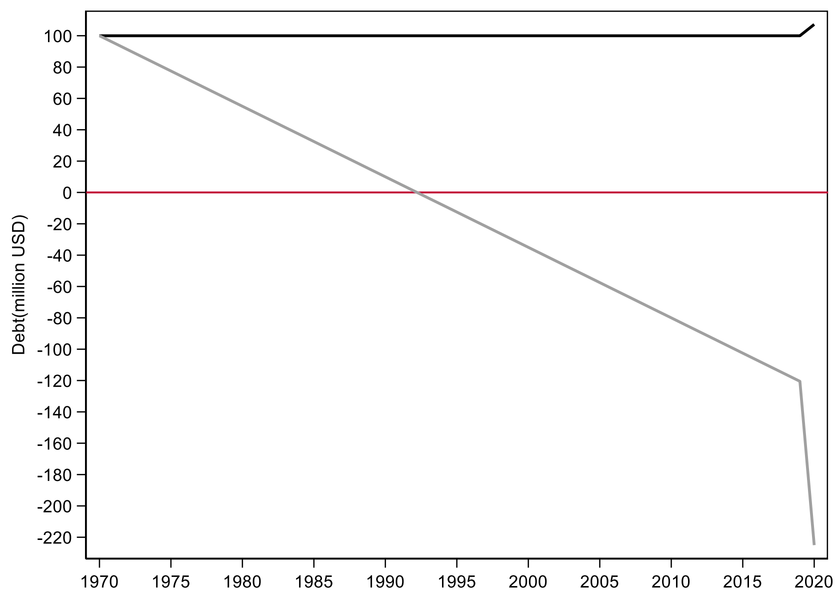

It is possible to use the same assumptions to ask what would country' s A net debt level be if it had been able to borrow at the same rate as the US and used the difference between the actual cash flows and the US rate to accumulate assets. For example, the actual cash flow in 1971 was $12.29 million, the cash flow with no spread would have been $7.79 million. Hence, the country would have been able to accumulate $4.5 million in assets and its net debt would then have been $95.5 million. Similarly, in 1972 net debt would be $91 million and so forth. Figure 2 plots country's A actual debt and counterfactual net debt. The country becomes a net creditor (net debt becomes negative) in 1993.

To keep things simple, I am assuming that the country stashes the funds it saves in cash (zero interest rate). If I had assumed that the country used these savings to repay its debt (or to buy US Treasuries), debt reduction would be faster. For instance, Figure 2 shows that in 1980 counterfactual debt is $55 million. Adding interest to savings reduces 1980 counterfactual debt to $36 million and the country becomes a net creditor ten year earlier (1983 instead of 1993).

**Figure 2**

**Actual and counterfactual net debt (country A)**

The solid black line plots the actual debt of country A and the solid gray line plots the net debt under the assumption of no spread




It is not surprising that a country that does not default but pays a substantial premium could obtain large savings if it were able to borrow at a safe rate. But what about a country that does default? Figure 3 plots the cash flow for country D. Up to the moment in which the country defaults (in 2000), the cash flow profiles (the black line) are identical to those of country A (compare Figure1 and Figure3). After the year 2000, country D no longer makes payments (neither interest nor principal, given the 100% haircut assumption) and actual cash flow (the black line) goes to zero. The gray line (which assumes no default) remains identical to that of Figure 1.

Surprisingly, we find that even with a full default, investors still realize a large IRR by lending to country D: the internal rate of return for country D is about 12%, just 40 basis points lower than the IRR with no default. Note that the IRR with default would still be higher than the counterfactual IRR even if the country had defaulted in 1990. The year of default that equalizes the IRRs is 1983.

**Figure 3**

**Actual and counterfactual cash flow (country D)**

The solid black line plots the actual cash flow of country A and the solid gray line plots the cash flow under the assumption of no spread


**Figure 4**

**Actual and counterfactual net debt (country D)**

The solid black line plots the actual debt of country A and the solid gray line plots the net debt under the assumption of no spread

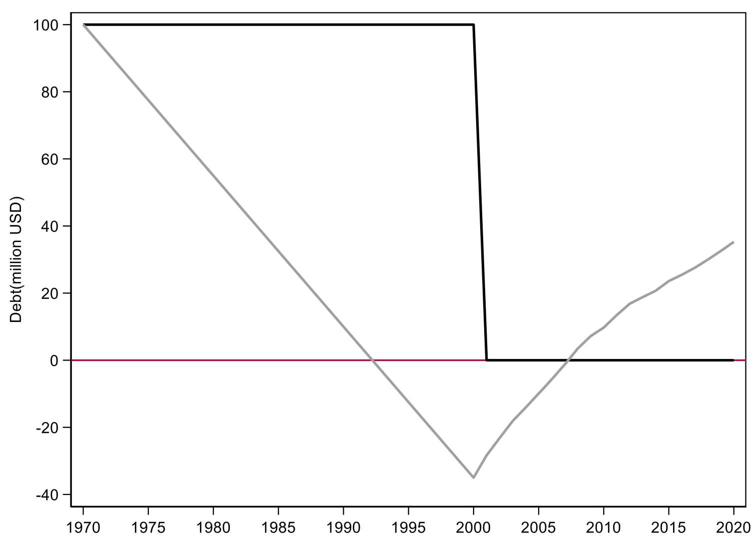
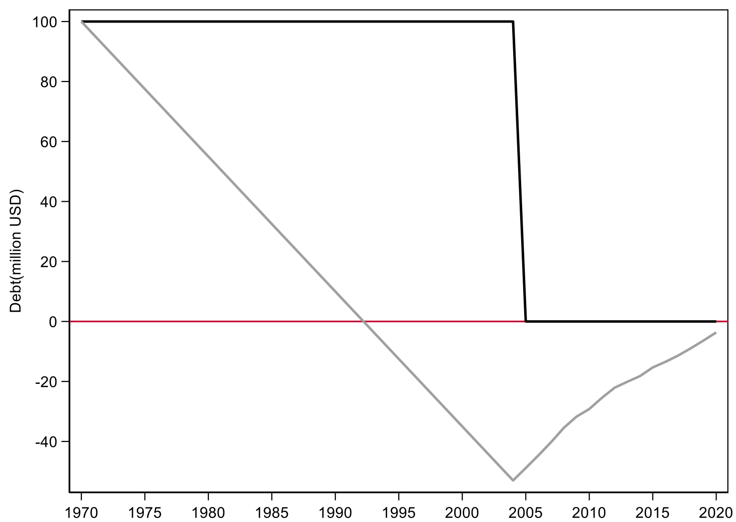



Figure 4 shows actual and net counterfactual debt for country D. Actual debt is at 100 (like in country A) until the moment in which the country defaults. It then goes to zero. Counterfactual net debt becomes negative in 1993 (as in country A), but starts increasing after default (under default actual payments are zero, while counterfactual payments remain positive). Debt become positive again in 2008 and, by 2020, it reaches $35 million. Under the assumptions of Figure 4, being able to borrow at the US rate has the same effect on debt sustainability as a 65% haircut. In fact, if we assume that default had happened in 2004 instead of 2000, we would find the same 2020 level of debt obtained with a 100% face value haircut (Figure 5).

**Figure 5**

**Actual and counterfactual net debt (country D, but with default in 2004)**

The solid black line plots the actual debt of country A and the solid gray line plots the net debt under the assumption of no spread




*4.2 Real world data*

I now apply an approach similar to the one described above to real world data for 16 emerging market countries over 1970-2020.

To compute actual and counterfactual IRRs, I use data on payment flows between private creditors and sovereign borrowers sourced from the World Bank's International Debt Statistics (IDS) and follow the approach of Klingen, Weder, and Zettelmeyer (2004, KWZ, henceforth).

Before going into details, two caveats are in order. First, some of the series that were reported in the World Bank Global Development Finance database (the precursor of the IDS) have been discontinued. Hence, I do to have access to these data. Second, KWZ had access to confidential information about cross-category debt restructuring operations and I do not have access to these data. Fortunately, these data are not essential and I can closely match the results of KWZ using the publicly available IDS data.

*Internal rate of return using actual flows*

To measure the initial disbursement, I follow KWZ and assume that the initial disbursement is the 1970 stock of public and publicly guaranteed (PPG) debt owed to private creditors. There are two issues with using this variable as a proxy for the initial disbursement: (i) while we would like to use the market value of the initial stock of debt, there are no secondary market prices for 1970; (ii) IDS data only report disaggregated figures for long-term debt. Therefore, I do not have information on short-term debt.

These two issues are conceptually important but are not important in practice (for details see KWZ). In 1970, the stock of debt was small compared to disbursements in the following years. Hence, its valuation has a limited effect on my calculations. With respect to short-term debt, it is worth noting that the classification refers to maturity at issuance and most private sector lending to the public sector in EM has original maturity greater than one year.

I also need to compute a final payment in 2020. The natural assumption is to use the market value of the final stock of debt. I use sovereign spreads to obtain this market value.

To compute annual cash flows, I focus on three key series from IDS (all based on PPG debt owed to private creditors, I do not include debt owed to bilateral and multilateral creditors) and compute net transfers in year $t$ ($NT_t$) as follows:

$$NT_t = DIS_t - PRINC_t - INT_t \quad (8)$$

Where $DIS_t$ are disbursements, $PRINC_t$ are principal repayments, and $INT_t$ are interest payments. Note that net transfers computed in this way already keep track of debt restructurings within categories. For instance, a face value haircut will be reflected in lower principal and interest payments down the road (or a change in either the face value or market value of the final debt stock). Similarly, a debt reprofiling will lead to lower future interest flows and possibly in a change of the market value of the final debt stock. The accumulation of interest arrears will also be reflected in future payments or in the final debt stock. Given that I focus on all debt owed to private creditors, swaps between bank loans and bonds do not affect the calculations.

One issue with the net transfers computed of Equation (8) is that they do not allow tracking exchanges across debt groups or debt-equity swaps. For instance, assume that some private non-guaranteed (PNG) debt is transformed into PPG debt. In this case, we would observe an increase of future principal and interest payments without having recorded any disbursement. This would lead to an overestimation of returns on PPG debt. The same happens if short-term debt is consolidated into long-term debt. A debt for equity swap would instead lead to the opposite problem and to an underestimation of returns.

KWZ correct for this issue in two ways. Their "direct" method uses confidential World Bank data to correct for cross-assets swaps. I cannot do this because I do not have access to these confidential data. However, KWZ also use an "indirect" method in which they compute cross-asset swaps using information from changes in the debt stock. Specifically, they start from the standard debt accumulation equation:

$$D_t - D_{t-1} = DIS_t - PRINC_t - DFR_t + CCV_t + IC_t + X_t + u_t \tag{9}$$

Where $D_t$ is the stock of PPG debt owed to private creditors, $DFR_t$ measures debt forgiveness and reduction, $CCV_t$ captures cross-currency valuation (not all debt is US dollars), $IC_t$ measures capitalized interest and interest arrears, $X_t$ measures the cross-asset swaps that we would like to measure, and $u_t$ is a random error assumed to have mean zero.

Data on $D_t$, $DIS_t$, and $PRINC_t$ are available from IDS at the needed category of aggregation (i.e., PPG debt owed to private creditors), $DFR_t$, $CCV_t$, and $IC_t$ are also available but, in the published data, they are only available at the level of PPG debt. I therefore assume that they are equally distributed between debt owed to private creditors and debt owed to official creditors and adjust the value reported by IDS accordingly (specifically, I multiply them by $D_t/PPG_t$, where $PPG_t$ is total public and publicly guaranteed debt).[17]

[17] KWZ use disaggregated confidential data. Also note that IDS only report CCV data for 1989-2008. I update these data with exchange rate series and data on currency composition of external debt from old vintages of Global Development Finance for the pre 1989 period and current vintages of IDS for the post

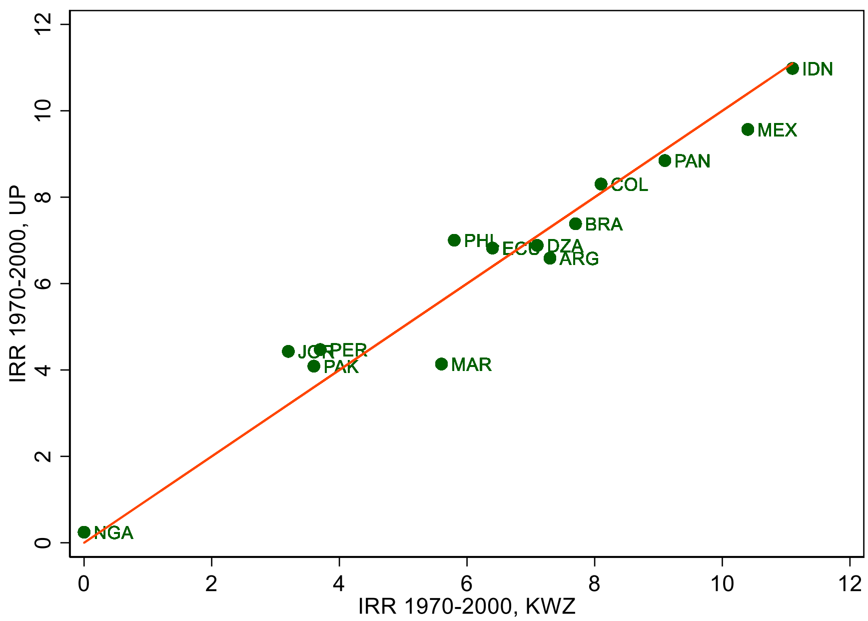
Assuming that $u_t$ has mean zero, it is possible to use equation (9) to back up $X_t$ and then use this value to adjust the net transfers of Equation (8). Adjusted net transfers are defined as:

$$ANT_t = NT_t + X_t \tag{10}$$

I can now use the initial stock of public debt, the adjusted net transfer of Equation (10), and the market value of the final stock of debt in 2000 (I use the market prices reported in Appendix Table 1 of KWZ) to estimate IRRs and compare them with the values reported by KWZ. Figure 6 shows that I can track closely the results of KWZ.

**Figure 6**

**Comparison between IIR for 1970-2000 computed in this paper and IRR reported by KWZ**




*Internal rates of return with no default and spread*

I now compute counterfactual cash flow under the assumption of no default and spread. There are three challenges with this methodology.

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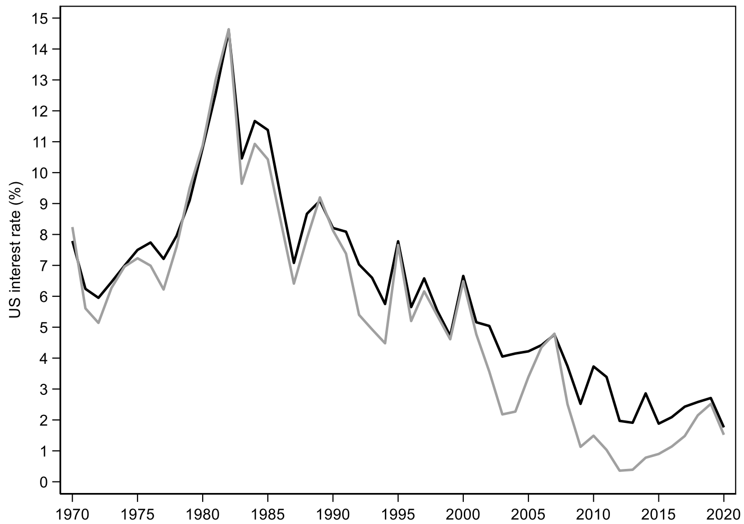
2008 period. Note that these data on currency composition include an "other currency" category. I assume that the other currency exchange rate is a weighted average of the currencies for which I do have shares.

**Figure 7**

**Interest rate on US Treasuries**

The solid black line plots the 10-year Treasury rate and the solid gray line plots 3-year Treasury rate




The first challenge relates to building a counterfactual pattern of disbursements and repayments that matches actual disbursement and repayment flows between private creditors and sovereign borrowers. KWZ suggest to compute returns of these counterfactual flows under the assumption that they had been invested in US Treasuries. The timing is important because the US safe rate went from about 15% in the early 1980s to 2-3% over 2010-20 (Figure 7).

The second challenge has to do with assuming that there was never a face value default (a debt reprofiling with no face value reduction does not affect the calculations). I will show that we do not necessarily need to adjust the series. However, I obtain similar results when I use data on face value haircut from Cruces and Trebesch (2013) to build a counterfactual stock of debt under the assumption of no default.

The third challenge relates to evaluating the duration of the stock of debt. OECD (2020) estimates that the average maturity at issuance of emerging market sovereign bonds went from about 5 years in 2000 to 5.5 years in 2020. However, there are many lending instruments with floating rates. This is especially the case for syndicated bank loans. KWZ estimate that in the 1980s floating debt represented more than 75% of the stock of emerging market debt. This share went down to 50% in the 1990s. The duration of floating rate instruments is shorter than maturity at issuance. An instrument with a floating rate that resets twice a year has an effective duration of six months, no matter what the maturity at issuance is. Given this uncertainty on effective duration, I will compute counterfactual internal rate of returns assuming 3 and 10-year US Treasury rates.[18]

To build counterfactual series, I use the following procedure based on KWZ. In any given year, net transfers to the country are given by Equation 8. Assuming a one-year zero coupon bond, this can be written as:

$$NT_t = G_t - (1 + i_{t-1})G_{t-1} \tag{11}$$

Where $G_t$ is gross disbursement at time $t$ and $i_{t-1}$ is the interest rate at time $t-1$. Note that for the initial period we set $NT_0 = p_0 D_0$, and for the final period, $NT_T = -(1 + i_{T-1})G_{T-1}$. The task is to obtain values for $G_t$ for $0 < t < T$.

To do this, recognize that, with a one-year zero coupon bond, net disbursements today are equal to gross disbursements in the previous year. Hence:

$$G_t - G_{t-1} = DIS_t - PRINC_t \tag{12}$$

More in general, KWZ show that with a zero-coupon bond that matures in $\tau$ years, we have that $G_t - G_{t-\tau} = DIS_t - PRINC_t$ and $NT_t = G_t - (1 + i_{t-\tau})G_{t-\tau}$. We can use these definitions to build a series for $G_t$. Assuming a one-year zero-coupon bond, we obtain:

$G_0 = p_0 D_0$

$G_1 = DIS_1 - PRINC_1 + G_0$

$G_2 = DIS_2 - PRINC_2 + G_1$

$G_3 = DIS_3 - PRINC_3 + G_2$

…

$G_T = DIS_T - PRINC_T + G_{T-1}$

[18] While I use 3 and 5 years interest rate, to simplify things I assume that all debt consists on one-year zero-coupon bonds.

With a 5-year zero-coupon bond, we have:

$$G_0 = p_0 D_0$$
$$G_1 = DIS_1 - PRINC_1$$
$$\ldots$$
$$G_4 = DIS_4 - PRINC_4$$
$$G_5 = DIS_5 - PRINC_5 + G_0$$
$$G_6 = DIS_6 - PRINC_6 + G_1$$
$$\ldots.$$
$$G_T = DIS_T - PRINC_T + G_{T-5}$$

The series built above do not contemplate the possibility of default. However, an adjustment might not be needed. Consider the case of a country that borrows 100 in year zero, at the end of each year rolls over its debt and pays interest, and, in year 5, repays principal and interests. The top panel of Table 3 shows the evolution of $G_t$ and the cash flow associated with this country.

Now assume that in period 2 the country defaults before the debt was rolled over and after default the country no longer borrows or repays (it becomes autarkic). The second panel of Table 3 shows that the evolution of both $G_t$ and the cash flow are identical to the non-default case, suggesting that no adjustment is needed.

Now assume that the default happens after the debt has been rolled over. The third panel of Table 3 shows that, if we make no adjustments, in year 2 there is a (negative) cash flow of $-100(2-i)$, in the following years there is a positive cash flow of $i200$, and in the final year there is a cash flow of $200(1+i)$. This is equivalent to assuming that in year 2, the country borrowed 100, bringing the total debt to 200, paid interests on this higher level of debt, and then repaid everything in year 5. This is a reasonable assumption because by borrowing to rollover and then not repaying, the country effectively borrowed 100 more.

An alternative way to adjust the payment flow is to assume that the default never happened, this is equivalent to impute a fake payment equal to the defaulted debt in year 2. The bottom panel of Table 3 shows that creating this fake payment (written in red in the table) brings us back to exactly the non-default situation of the top panel. This is also a reasonable method to adjust for default.

This approach is likely to yield a higher internal rate of return because it anticipates the assumed repayment of the default debt.

**Table 3**
**How to adjust for default**

| Time | Disbursements | Repayments | $G=D_t-R_t+G_{t-1}$* | $(1+i)G_{t-1}-G_t$ |
|---|---|---|---|---|
| | | **No Default** | | |
| 0 | 100 | | 100 | -100 |
| 1 | 100 | 100 | 100-100+100=100 | (1+i)100-100=i100 |
| 2 | 100 | 100 | 100-100+100=100 | (1+i)100-100=i100 |
| 3 | 100 | 100 | 100-100+100=100 | (1+i)100-100=i100 |
| 4 | 100 | 100 | 100-100+100=100 | (1+i)100-100=i100 |
| 5 | | 100 | | (1+i)100 |
| | | **With default in period 2 *prior* to disbursement** | | |
| 0 | 100 | | 100 | -100 |
| 1 | 100 | 100 | 100-100+100=100 | (1+i)100-100=i100 |
| 2 | | | 100 | (1+i)100-100=i100 |
| 3 | | | 100 | (1+i)100-100=i100 |
| 4 | | | 100 | (1+i)100-100=i100 |
| 5 | | | 100 | (1+i)100 |
| | | **With default in period 2 *after* disbursement, no adjustment** | | |
| 0 | 100 | | 100 | -100 |
| 1 | 100 | 100 | 100-100+100=100 | (1+i)100-100=i100 |
| 2 | 100 | | 100+100=200 | (1+i)100-200=i100-200 |
| 3 | | | 200 | (1+i)200-200=i200 |
| 4 | | | 200 | (1+i)200-200=i200 |
| 5 | | | | (1+i)200 |
| | | **With default in period 2 *after* disbursement, with adjustment** | | |
| 0 | 100 | | 100 | -100 |
| 1 | 100 | 100 | 100-100+100=100 | (1+i)100-100=i100 |
| 2 | 100 | **100** | 100+100-**100**=100 | (1+i)100-200=i100 |
| 3 | | | 100 | (1+i)100-100=i100 |
| 4 | | | 100 | (1+i)100-100=i100 |
| 5 | | | | (1+i)100 |

* Except at t=0 and t=T.

I experiment with both approaches and obtain similar results. However, in the baseline, I use the approach without adjustment because it is simpler and does not require information of face value debt cancelations.[19]

[19] When I adjust for face value cancelation, I estimate the amount of defaulted debt by applying the face-value haircut of Cruces and Trebesch (2013) to the stock of external debt owed to private creditors in time $t-1$.

*Results*

Figure 8 plots actual (the black line) and counterfactual (the gray line) cash flows for all the countries studies in this paper. In many cases, counterfactual cash flows where higher in the 1980s and early 1990s. This was a period during which actual cash flows tended to be low because of continuous debt rescheduling that implied NPV losses for creditors. In the 1980s, and early 1990s there were also a few cases of face value debt reductions. In most countries actual cash flow surpassed counterfactual cash flows in the early 2000s (Argentina, Algeria, Ecuador and Egypt are notable exceptions). Given that internal rates of return are computed form the point of view of 1970, this time profile of actual and counterfactual cash flow leads to a relative high IRR for actual cash flows.

**Figure 8**

**Actual and counterfactual private creditors cash flow over 1970-2020 (% of GNI)**

The black lines plot actual cash flow and the gray lines counterfactual cash flow computed using the 10-year US rate. For presentation purposes, the graphs do not include cash flow in the last year (2018 for Thailand and 2020 for all other countries)

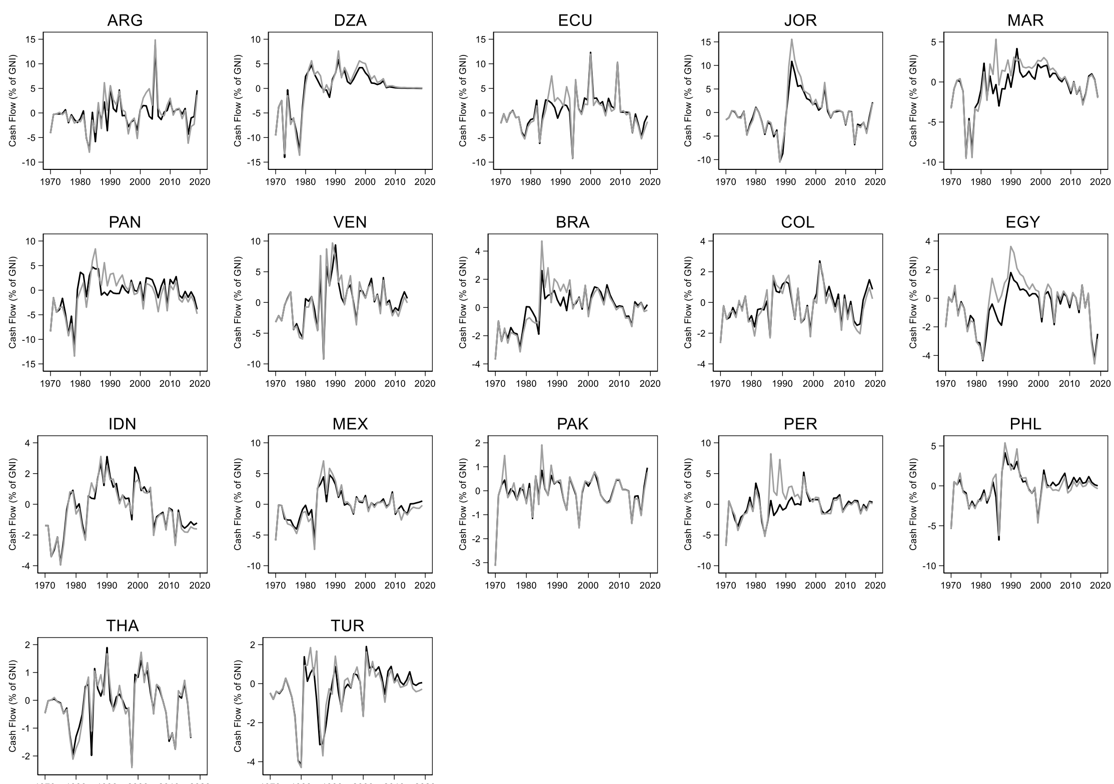


Figure 9 plots the evolution of actual (the black line) and counterfactual (the gray line) debt-to-GDP ratio. The red line shows the market value debt-to-GDP ratio for year 2020 (this is important for Argentina and Ecuador). Over the past 20 years, actual face value debt levels surpassed no-default counterfactual debt levels in most countries. By 2020, there were only two countries (Egypt and Morocco) for which counterfactual debt-to-GDP was at least 3 percentage points higher than actual face value debt level, and one country (Argentina) for which counterfactual debt-to-GDP was at least 3 percentage points higher than actual market value debt level. There were instead 8 countries for which counterfactual debt level was much smaller than actual debt levels.

**Figure 9**

**Actual and counterfactual External debt owed to private creditors 1970-2020 (% of GNI)**

The black lines plot actual debt, the red-lines final-year actual debt evaluated at market price, and the gray lines plot counterfactual debt computed using the 10-year US rate.

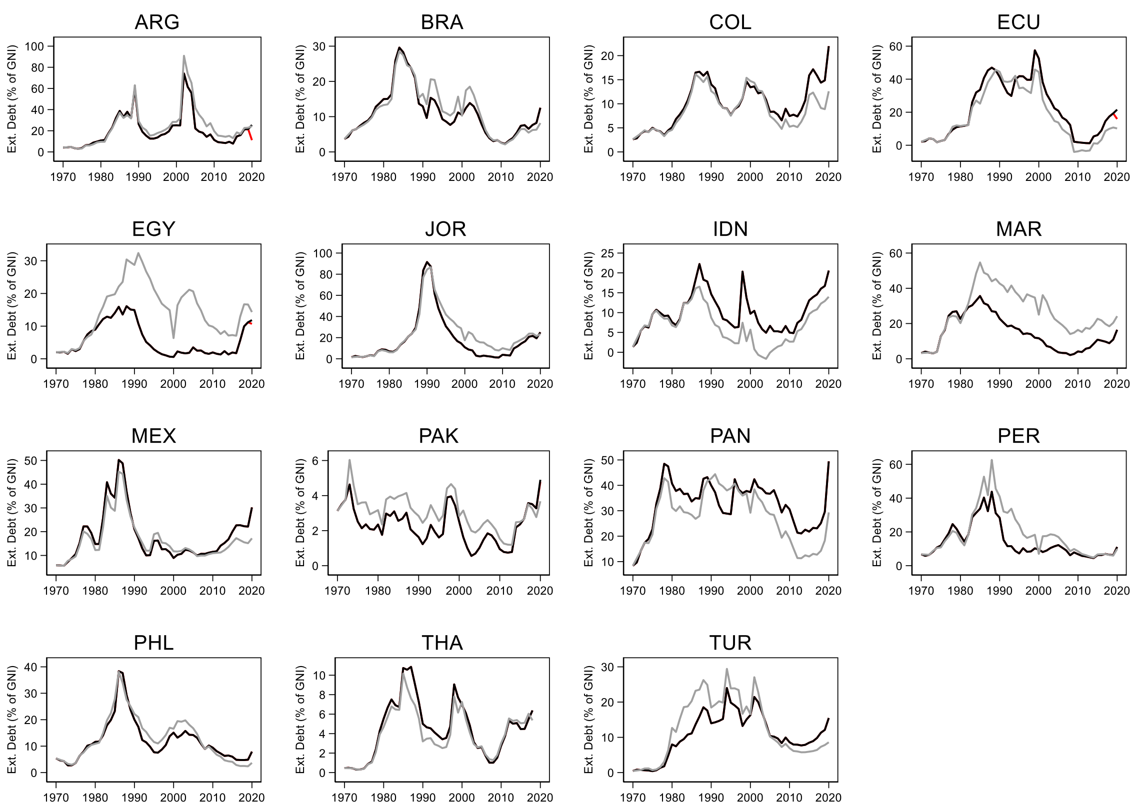



Table 4 computes actual rate of returns over 1970-2020 and compares them with counterfactual rate of returns using 3 and 10-year US rates. It also reports actual and counterfactual debt levels in 2020 (as a share of GDP). The actual debt level is measures both at face value and market value.

**Table 4**

**Actual and Counterfactual Internal Rates of Return and Debt Levels (1970-2020)**

| | Internal rate of return | | | External debt owed to private creditors in 2020 (% | | |
|---|---|---|---|---|---|---|
| | Actual | Counterfactual | | Actual | | Counterfactual |
| | | 10-year US | 3-year US | Face value | Market price | 10-year US rate |
| ARG | **4.1%** | 4.8% | 5.0% | **25.4** | **13.0** | 24.3 |
| BRA | **7.3%** | 7.2% | 7.0% | **12.5** | **12.5** | 8.1 |
| COL | **8.0%** | 4.0% | 2.0% | **21.9** | **21.9** | 12.6 |
| DZA | **7.0%** | 7.9% | 7.9% | n.a. | n.a. | n.a. |
| ECU | **8.1%** | 7.8% | 7.6% | **21.5** | **16.9** | 10.2 |
| EGY | **0.1%** | 2.4% | 2.5% | **11.8** | **10.7** | 14.3 |
| IDN | **9.1%** | 4.1% | 3.3% | **20.6** | **20.6** | 13.9 |
| JOR | **6.1%** | 5.9% | 5.4% | **25.1** | **25.1** | 23.3 |
| MAR | **4.6%** | 7.3% | 7.0% | **16.5** | **16.5** | 24.1 |
| MEX | **8.6%** | 4.7% | 5.1% | **30.2** | **30.2** | 17.2 |
| PAK | **5.8%** | 5.6% | 3.8% | **4.9** | **4.6** | 3.6 |
| PAN | **8.7%** | 8.5% | 4.0% | **49.4** | **49.4** | 29.3 |
| PER | **5.5%** | 7.2% | 6.2% | **11.1** | **11.1** | 9.9 |
| PHL | **7.5%** | 4.8% | 4.8% | **7.9** | **7.9** | 3.7 |
| THA* | **6.2%** | 4.6% | 2.5% | **6.4** | **6.4** | 5.4 |
| TUR | **6.6%** | 3.8% | 3.5% | **15.5** | **15.5** | 8.6 |
| | Average | | | | | |
| Weigh. | **7.2%** | 6.0% | 4.6% | | | |
| Simple | **6.5%** | 5.7% | 4.9% | | | |

*Data for Thailand end in 2018.
Red values indicate situation in which actual returns or debt levels were at least 1 percentage point higher than counterfactual returns. Green value, show the opposite

There are five countries (marked in red) for which actual rate of returns are lower than counterfactual rates of returns evaluated using the 10-year US Treasury rate and assuming no default. These countries are: Argentina, Algeria, Egypt, Morocco and Peru. The difference is particularly large in Egypt and Morocco. For the remaining 11 countries (marked in green), actual rates of return are higher than the US rate with no default. The difference is particularly large (more than 3 percentage points) for Colombia, Indonesia, and Mexico.

If we take the simple average of all countries included in Table 4, we find that actual returns were 80 basis points higher than counterfactual returns with the US rate, the (cash flow) weighted average yields a larger difference (120 basis points)

As shown in Figure 9, counterfactual 2020 debt levels were higher than actual debt levels at face value for Egypt and Morocco and also higher than actual debt levels at market value for Argentina. Counterfactual debt levels were instead much lower than actual debt levels for 8 countries (Brazil, Colombia, Ecuador, Indonesia, Mexico, Panama, Philippines, and Turkey).

KWZ show that internal rates of returns differed significantly across periods and that they tended to be low in the 1980s and high in the 1990s. In Table 5, I first split the sample into two 25-year periods (1970-95 and 1995-2020) and then also look at the last twenty (2000-20) and fifteen years (2005-20). I evaluate debt levels in 1970 using face values and debt levels in 1995, 2000 and 2005 using market value (market values for 1995 and 2000 are from KWZ 2005 market values are based on spread data).

**Table 5**

**Actual and Counterfactual Internal Rates of Return over different periods**

| | 1970-1995 | | 1995-2020 | | 2000-2020 | | 2005-2020 | |
|---|---|---|---|---|---|---|---|---|
| | Actual | Counterfactua | Actual | Counterfactua | Actual | Counterfactua | Actua | Counterfactua |
| ARG | **5.5%** | 9.1% | **2.1%** | 4.2% | **2.6%** | 3.7% | 2.9% | 2.9% |
| BRA | **6.4%** | 9.3% | **10.2** | 4.0% | **13.6** | 3.3% | **5.9%** | 2.8% |
| COL | **9.4%** | 9.1% | **7.3%** | 3.6% | **8.1%** | 3.2% | **7.3%** | 2.8% |
| DZA | **5.4%** | 9.2% | n.a. | n.a. | na | n.a. | n.a. | n.a. |
| ECU | **3.4%** | 9.4% | **16.8** | 5.2% | **20.6** | 4.1% | 3.1% | 3.1% |
| EGY | **-6.2%** | 9.3% | **2.5%** | 3.0% | 2.0% | 2.9% | **2.6%** | 2.7% |
| IDN | **11.2** | 9.3% | **6.5%** | 3.1% | **5.8%** | 2.8% | **4.2%** | 2.6% |
| JOR | **5.8%** | 8.7% | **2.9%** | 3.6% | **3.7%** | 2.8% | **3.9%** | 2.5% |
| MAR | **2.9%** | 9.3% | **8.1%** | 4.0% | **9.0%** | 3.0% | **4.6%** | 2.7% |
| MEX | **8.8%** | 9.4% | **8.7%** | 3.5% | **9.1%** | 3.1% | **6.4%** | 2.8% |
| PAK | **6.0%** | 8.8% | **5.1%** | 3.6% | **5.1%** | 3.1% | **6.6%** | 2.8% |
| PAN | **6.8%** | 9.2% | **11.3** | 3.5% | **10.5** | 3.2% | **7.1%** | 2.9% |
| PER | **-0.6%** | 9.0% | **41.9** | 3.1% | **8.0%** | 3.3% | **5.6%** | 3.0% |
| PHL | **6.5%** | 9.3% | **8.8%** | 3.8% | **11.2** | 3.4% | **9.8%** | 3.0% |
| THA* | **11.1** | 9.7% | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| TUR | **6.5%** | 9.0% | **7.1%** | 4.1% | **7.8%** | 3.5% | **6.5%** | 2.9% |
| | | | | Average | | | | |
| Weigh | **9.1%** | 9.3% | **5.8%** | 3.8% | **6.0%** | 3.3% | **5.8%** | 2.8% |
| Simple | **5.6%** | 9.2% | **9.9%** | 3.7% | **8.4%** | 3.2% | **5.5%** | 2.8% |

*Data for Thailand end in 2018.

The counterfactual is calculated using 10-year US rates. Red values indicate situation in which actual returns were at least 1 percentage point higher than counterfactual returns. Green value, show the opposite The last row is a simple

As already shown by KWZ, actual returns before 1995 were low and in most cases lower than counterfactual returns. The exceptions are Colombia, Indonesia, and Thailand (in the last two countries actual returns were much higher than counterfactual returns). Focusing on the weighted average, I find actual returns which are 20 basis points lower than counterfactual returns, while the simple average yields a larger difference (actual returns are 3.6 percentage point lower than counterfactual returns)

The opposite is true in the post 1995 period. Over 1995-2020, the majority of countries (11 out of 14) has actual returns which are above counterfactual returns (the exceptions are Argentina, Egypt, and Jordan). The weighted average of actual returns is 2 percentage points higher than the counterfactual and for the simple average the difference is more than 6 percentage points (this is influenced by very high returns for Peru and Ecuador). The 2000-2020 and 2005-2020 subperiods paint a similar picture but with an even larger difference between actual and counterfactual returns.

Taken together, the results of Tables 4 and 5 suggest that over 1970-2020 most of the countries examined in this paper did not have solvency problems. Had they been able to borrow at the same conditions at which the US can access the international capital market, the majority of these countries would have paid less to international creditors without the need to restructure their debts and would now have lower debt levels.

Note that my results are consistent with those of KWZ and are conservative with respect those of Meyer, Reinhart, and Trebesch (2019) who found that over 1815-2016 emerging market debt had an ex-post excess return of about 400 basis points with respect to US and UK government bonds.

There are a few exceptions. Specifically, the calculations described above do suggest that Argentina, Peru, Egypt, and Morocco may have had solvency problems. However, even for these countries, final debt ratios are not very different from counterfactual final debt ratios. This suggest that a long history of default did not substantially lower their debt levels over the long run (Benjamin and Wright, 2013 and Sturzenegger and Zettelmeyer, 2007).

Note that in building the counterfactual debt-to-GDP ratio, I used the evolution of actual GDP. It is plausible that counterfactual GDP without debt crises would be higher. For instance, if we assume that default reduces the *level* of GDP by 5% (this is a standard assumption in the literature), we would find that Argentina's GDP in 2020 would be about 18% higher than actual GDP. This would bring the counterfactual debt level from 24% of GDP to 20% of GDP. As debt crises have a negative effect on GDP growth also when they do not result into a default. It is likely that true counterfactual debt-to-GDP ratio are lower than what reported in Table 4.

One key caveat is that I am also assuming that counterfactual repayment and disbursements are the same as actual repayments and disbursements. However, if countries had unconstrained access to global capital, they would have probably borrowed more in net terms. We do not know what would have happened to the Debt-to-GDP ratio with easier access to credit. If this extra borrowing had been used well (i.e., invested in assets with long-term returns which are higher than the interest charged on the borrowed funds), GDP would be higher and debt ratios lower. If this the extra borrowing had been used to finance wasteful public expenditure or ended in the pockets of corrupt politicians, debt ratios would be higher.

## 5 Policy implications

The previous section shows that countries can face debt crises even when they are solvent. This suggest that both the international financial institutions and credit rating agencies should develop tools for assessing long term debt sustainability. Credit rating agencies could also develop similar tools for investors with long term objectives.

In practice, assessing long-term debt sustainability is a difficult exercise because it requires long-term forecast which tend to be imprecise. Moreover, knowing that debt is sustainable in the long-term may not be of much help to a country that cannot rollover its debt. Within the current international financial architecture, even investors who buy long term bonds are affected by liquidity driven default episodes because defaults accelerate all debts. At time of crisis all debt is essentially short-term.

However, a fully credible long-run debt sustainability analysis can help in ruling out liquidity crises. Most advanced economies have continuous access to the capital markets because investors believe that their debt is sustainable.

The international financial institutions could use such a tool to guide policy advice and provide financing to countries that are fundamentally solvent. This is part of the mandate of the IMF, but as discussed in the introduction, the Fund's definition of debt sustainability does not focus on long-term solvency as it focuses on restoring market access in the short to medium run. A fully credible assessment of long-term debt sustainability could lead to the creation of long-term facilities that go beyond standard IMF financing and the promotion of instrument such as contingent and local currency debt bonds that reduce the likelihood of self-fulfilling debt crises. Note that in building counterfactual debt levels I had to make several assumptions on debt structure and composition. Hence, my calculations are very much back of the envelope. However, the IFIs have the data and the resources to build more precise and credible estimates.

Given the imperative of promoting the transition to a low carbon economy, it is also necessary to design financial instruments that promote green investment without having negative effects on long-term debt sustainability.

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