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Abstract

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JEL Classification: E52, E58, E62, H62, H63

Keywords: Sovereign debt, debt sustainability, Fiscal policy, Debt crises, Fiscal-monetary interactions, central bank credibility

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Sovereign Debt Sustainability and Central Bank Credibility

Tim Willems and Jeromin Zettelmeyer[1]

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ABSTRACT

This paper surveys the literature on sovereign debt sustainability from its origins in the mid-1980s to the present, focusing on four debates. First, the shift from an "accounting based" view of debt sustainability, evaluated using government borrowing rates, to a "model based" view which uses stochastic discount rates. Second, empirical tests focusing on the relationship between primary balances to debt. Third, debt sustainability in the presence of rollover risk. And fourth, whether government borrowing costs below rates of growth ("$r < g$") generate a "free lunch" in the sense that debt sustainability does not require future primary surpluses. We argue that liquidity services provided by sovereign debt may indeed lead to a "free lunch", albeit of limited size. The value of such services depends on the credibility of the central bank, which can be accumulated via prudent policies and subsequently drawn on to allow for looser fiscal policy.

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1. Introduction

Sovereign debt is unsustainable if it cannot be repaid without altering the contractual terms of the debt or rendering them irrelevant, via default, restructuring, or hyperinflation. Fiscal policy is unsustainable if preventing such an event requires a change in (fiscal) policy. If the required policy change is feasible, debt is sustainable although status-quo policies are not. If the change in policy is infeasible for social or political reasons, or because of prohibitive economic costs (such as the efficiency or growth costs associated with cutting essential government spending or raising already high taxes), debt is unsustainable.

This survey deals with economic concepts that help define, and empirical methods that seek to determine, whether fiscal policy—or indeed debt—is sustainable. Drawing on a recent literature that links debt sustainability to the liquidity services provided by sovereign debt (rather than just future primary balances), it also points to links between debt sustainability and central bank policy credibility which seem worth further exploration.

Like is often the case, the interest in debt sustainability developed in response to triggering events. First, the 1980s Latin American debt crisis, which created concepts such as debt overhang and self-fulfilling debt crises, and forced economists, particularly in policy institutions, to develop techniques to help decide whether sovereigns should be considered insolvent or merely illiquid. Second, widening fiscal deficits in the United States in the 1980s, which raised the question whether U.S. fiscal policy was on an unsustainable trajectory. Third, a recent phase of deficits and sharply higher debts, in part preceding the Covid crisis and partly triggered by it. The debate around the sustainability of these debts and deficits resembles that of the 1980s and early 1990s, including because the U.S. is again at the center of it. But the economic environment is different, as real interest rates in many countries are lower than real growth rates, and projected to remain so for some time. This has recently led to a debate on how to think about debt sustainability when "$r < g$", which could lead to falling debt as a share of GDP even if governments never run primary (non-interest) fiscal surpluses. While there is agreement that fiscal policy remains subject to sustainability constraints in this environment, there is much less agreement on how these constraints should be defined and when they become binding.

This paper consists of five sections, which are structured to both reflect the historical development of the literature and introduce tools and concepts that are used and developed in subsequent sections.

Section 2 introduces fiscal accounting relationships that have become the backbone of debt sustainability analyses. The combination of these accounting relationships with a condition following from economic optimization—the so-called no-Ponzi-game condition (NPGC)—

leads to the intertemporal government budget constraint (IGBC). One definition of fiscal policy sustainability is that the IGBC holds. An alternative definition is that government debt does not explode as share of GDP. As it turns out, the latter implies the former. The initial empirical literature on debt sustainability has focused mainly on the IGBC, whereas debt sustainability analyses in policy institutions have focused on (non-)stabilization of debt ratios.

Section 3 deals with two seminal contributions by Henning Bohn and the reactions that they triggered. In the first, he argued that the version of the NPGC which the literature had been working with (discounting future primary surpluses at the sovereign's cost of borrowing) was inappropriate in an environment with uncertainty and risk-averse economic agents (which calls for stochastic discounting). This implies that fiscal policy could be unsustainable even when the traditional IGBC seems to be satisfied. In the second, he proposed an alternative test for debt sustainability, which would imply debt sustainability under a broader range of conditions, based on detecting a feedback effect from debt to fiscal policy. A subsequent literature found that this feedback weakens at high debt levels, suggesting that there could be critical debt levels beyond which debt will explode.

Section 4 examines how debt sustainability is affected by rollover risk. Whether rollover risk should enter debt sustainability analyses is partly a matter of definition: if sustainable debt is debt that can be repaid conditional on normal market access, then liquidity problems are out of scope. But if debt sustainability analysis is about debt levels and terms that are likely to lead to a debt restructuring or high inflation, then these problems are very much in scope, as they affect interest rates and debt dynamics, and reduce the levels of debt that can be considered safe. Debt sustainability analyses in policy institutions such as the IMF have recently focused on integrating rollover risk. Reducing rollover risk requires lengthening debt maturity, borrowing in domestic currency, and building central bank credibility.

Section 5 deals with the implications of $r < g$ and the debate on debt sustainability in today's advanced economies. An important element of this debate considers whether economic agents will hold debt even when the government is not expected to generate future primary surpluses. The answer depends on whether debt performs a "safe asset" function (store of value and source of liquidity) that, in effect, provides a workaround for the inability of consumers to borrow against their future income. To the extent that it does, governments really do enjoy a free lunch. But the degree to which they do is restricted by the value of the service flow associated with safe debt, and attempts at overexploitation (by issuing too much debt) amount to slaughtering the golden goose.

Section 6 concludes with some thoughts on the link between debt sustainability and central bank credibility (in the sense of rendering inflation expectations "well anchored", i.e., relatively insensitive to short-term policy actions and incoming data points). The literature reviewed in sections 4 and 5 implies that credible central banks can expand the boundary of sustainable debt and deficits, and with it the scope for countercyclical fiscal policy: by reducing rollover risk in the primary market; by allowing the development of secondary markets for sovereign debt denominated in local currency; by ensuring that these markets remain liquid during crises; and by improving the cyclical properties of debt from the perspective of consumers (lower interest rates in a recession raise the market value of debt when consumers need it). Hence, central bank credibility functions like a fiscal asset: a form of reputational capital that sovereigns can accumulate via sustained, prudent policy and subsequently draw upon to alleviate debt vulnerabilities when needed. Cross-country differences in central bank credibility could be part of the explanation why all countries do not seem to be created equal when it comes to sustaining a given debt level. Countries that wish to enjoy greater fiscal space should invest in building central bank credibility. As the latter is inconsistent with fiscal dominance over monetary policy, this will require both strong monetary policy frameworks and a track record of fiscal prudence.

2. Accounting-based debt sustainability analysis when $r > g$

Central to any discussion on debt sustainability is the government budget constraint and the associated debt dynamics. Assuming the most basic setup (e.g., abstracting from debt denominated in foreign currency), the evolution of government debt is captured by:

$$B_{t+1} = (1 + r_t)B_t - S_{t+1} \tag{1}$$

where B_t refers to debt at time t (measured at the end of the period), r_t to the government borrowing rate, and S_t to the primary balance (government revenues, including seignorage, minus non-interest expenditures).

There are two ways to interpret this equation:

- First, if one assumes that all debt matures after one period, B_t is the nominal (or real) level of debt outstanding. The entire debt stock falls due in every period and needs to be refinanced. The new debt, B_{t+1}, is hence equal to the old debt, B_t, plus interest expenditures, $r_t B_t$, minus any primary surplus, S_{t+1}. In this interpretation, r_t is the contractual interest rate (the government's cost of borrowing) on one-period debt.
- Second, one can interpret B_t as the market value (real or nominal) of outstanding debt. This has the advantage that one does not have to assume that debt is one period. r_t can then no longer be interpreted as the contractual interest rate, but rather represents the holding return on debt, i.e. the contractual interest rate ("coupon") plus any capital gains or losses (see e.g. Wilcox (1989) or Reis (2021)).

The market value interpretation turns out to be more flexible and dominates the literature. Debt is not actually issued at a uniform, one-period maturity, but at many different maturities with different contractual interest rates. The market value offers an easy way of aggregating these different maturities into one number. In addition, assessing the government's financial situation and associated choices requires the use of market value. The latter measures the government's opportunity cost of owing that debt (the amount of cash it would need to raise through fresh borrowing to repay the old debt), which is the relevant concept when considering alternative policies.[2,3]

In policy discussions, debt (whether at face value or market value) is usually expressed as a share of GDP, which is thought to proxy the government's ability to raise revenues. We hence divide both sides of equation (1) by GDP, denoted Y_t (nominal GDP if B_t is expressed in current values, or real GDP if B_t was deflated by the price level). Defining $(1+g_t) \equiv Y_{t+1}/Y_t$, and using lower case letters to denote shares of GDP, we obtain:

$$b_{t+1} = \frac{1+r_t}{1+g_t} b_t - s_{t+1} \qquad (2)$$

Iterating this equation forward *n* times gives:

$$b_{t+n} = \frac{1+r_{t+n-1}}{1+g_{t+n-1}} * \frac{1+r_{t+n-2}}{1+g_{t+n-2}} * \dots * \frac{1+r_t}{1+g_t} * b_t - \frac{1+r_{t+n-1}}{1+g_{t+n-1}} * \frac{1+r_{t+n-2}}{1+g_{t+n-2}} * \dots * \frac{1+r_{t+1}}{1+g_{t+1}} * s_{t+1} \qquad 0$$
$$- \frac{1+r_{t+n-1}}{1+g_{t+n-1}} * \frac{1+r_{t+n-2}}{1+g_{t+n-2}} * \dots * \frac{1+r_{t+2}}{1+g_{t+2}} * s_{t+2} - \dots - s_{t+n}$$

Defining $q_{t,t+j} \equiv \prod_{h=t}^{t+j-1} \frac{1+g_h}{1+r_h}$ (the growth-adjusted discount factor to be applied between periods t and $t+j$), this can be rewritten in more compact form as:

$$b_{t+n} = \frac{1}{q_{t,t+n}} b_t - \frac{1}{q_{t,t+n}} \sum_{j=1}^{n} q_{t,t+j} s_{t+j} \qquad (3)$$

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[2] Not taking a market value perspective, a sovereign will falsely believe that it is better off it can borrow $1 billion afresh to buy back $2 billion in face value trading at 50 cents to the dollar. This neglects that the interest rate on the new loan will be greater than that on the old loan, which is why the latter is trading below par to begin with. Similar opportunity cost logic makes market valuation the right way to value any financial assets of the government. Not applying to same concept to the liability side would make a sovereign erroneously believe that it could issue debt at a fixed rate, invest the proceeds in another asset with the same maturity and risk profile, and be better off following a fall in the interest rate (as that would make the market value of its asset rise above the face value of its liability).

[3] At first, it might seem puzzling that a lower interest rate (which one would think of as improving debt sustainability) makes the market value of a country's debt go up (suggesting a worsening in debt sustainability). But, as we will see below, it is wrong to equate a rise in the market value of debt with worsened debt sustainability: the lower interest rate will also raise the present value of future surpluses, which works to improve debt sustainability.

Solving for b_t results in an equation stating that today's debt must equal "terminal" debt times the discount factor $\left(b_{t+n}q_{t,t+n}\right)$ plus the discounted value of future primary surpluses between $t+1$ and $t+n$:

$$b_t = q_{t,t+n}b_{t+n} + \sum_{j=1}^{n} q_{t,t+j}s_{t+j} \tag{4}$$

Further analysis of equation (4) requires us to make an assumption about the average sign of $r-g$. When the debt sustainability literature took off in the 1980s, government borrowing rates were higher than growth rates ("$r > g$") in most countries, making this case seem the relevant one for the purposes of analyzing debt sustainability. While most advanced economies are now in a situation where their government borrowing rates lie below growth rates (a case discussed in Section 5), $r > g$ still applies to many developing countries (where government borrowing rates often feature a premium reflecting default risk).

In the above framework, $r_t > g_t$ for all t implies $q_{t,t+j} < 1$. What the results in this section require is something slightly weaker: $r_t > g_t$ does not need to hold for every period t, but it needs to hold on average, in the sense that $\lim_{j\to\infty} q_{t,t+j} = 0$.

In this setting, the literature has suggested two ways of operationalizing the broad, qualitative definitions of policy- and debt sustainability proposed in the introduction.

The first, going back to Hamilton and Flavin (1986), is that fiscal policy sustainability requires the intertemporal government budget constraint ("IGBC", also referred to as present value budget constraint) to hold:

$$b_t = \lim_{n\to\infty} \sum_{j=1}^{n} q_{t,t+j}s_{t+j} \tag{5}$$

From equation (4), this requires:

$$\lim_{n\to\infty} q_{t,t+n}b_{t+n} = 0 \tag{6}$$

The literature refers to (6) as the "transversality condition" (TVC) or "no-Ponzi-game condition" (NPGC).[4] It states that the debt grows asymptotically at a rate below the growth-adjusted asymptotic rate of interest. This rules out "debt bubbles" where the value of debt

[4] While the two are often conflated, they are actually concerned with ruling out opposite outcomes: NPGC is a restriction on behavior that prevents overaccumulation of debt ($\lim_{n\to\infty} q_{t,t+n}b_{t+n} \leq 0$), while TVC is a prescription for optimality—preventing overaccumulation of wealth ($\lim_{n\to\infty} q_{t,t+n}b_{t+n} = 0$).

rises over time purely on the expectation that it can be sold at higher value in the future. In a model without uncertainty or with risk-neutral consumers/investors, equation (6), with rates of interest equal to consumer rates of time preference, follows from individual optimization (no rational investor would want to be on the losing side of a Ponzi game). Importantly, however, the NPGC will take a different form in an environment with uncertainty and risk-averse consumers—an issue to which we return in Section 3.

The IGBC (5) tells us that the current stock of debt outstanding should equal the expected present discounted value of future primary surpluses. If the left-hand side of equation (5) is greater than the right-hand side, the equality must ultimately be restored. One option is to adjust via policies, including fiscal adjustment (higher taxes or lower primary spending), reforms that raise the real growth rate, or higher seignorage revenues (typically leading to higher rates of inflation, a phenomenon referred to as "fiscal dominance" over the central bank).[5] These policies act on the right-hand side of the IGBC. Another way is to act on the left-hand side (bringing down b), through a default, hyperinflation, or debt restructuring.

A second definition, proposed by Kremers (1988, 1989) based on Blanchard (1984), regards fiscal policy as sustainable when current and projected future policy does not lead to an exploding debt ratio. The argument is that if the debt ratio did explode, the resources required to service the debt would at some point exceed the government's capacity to tax. A sufficient condition for a non-explosive debt ratio is that:

$$\lim_{n\to\infty} b_{t+n} = b, \text{ where } b \text{ is a constant} \tag{7}$$

Note that (7) is a stronger condition than (6). With $\lim_{n\to\infty} q_{t,t+n} = 0$, $\lim_{n\to\infty} b_{t+n} = b$ implies $\lim_{n\to\infty} q_{t,t+n} b_{t+n} = 0$, the NPGC and hence the IGBC. But conversely, the NPGC/IGBC do not imply $\lim_{n\to\infty} b_{t+n} = b$. Specifically, if the debt grows at faster rate than GDP but below the interest rate, then (7) would be violated although (6) and (5) would be satisfied.

Several papers written during the 1980s and early 1990s used these two criteria to test debt sustainability by analyzing the stationarity and cointegration properties of fiscal time series. Hamilton and Flavin (1986) test the NPGC (6) by conducting a unit root test to see if U.S. real

[5] For this reason, following Sargent and Wallace (1981), some of the early literature on debt sustainability focused on the consistency of fiscal projections with inflation objectives (Buiter, 1983; 1985; Anand and Van Wijnbergen, 1989). In this literature, the central bank eventually disregards its inflation objective and increases the rate of money growth so that the government can continue to meet its financial obligations. In a related literature, known as the Fiscal Theory of the Price Level (Leeper, 1991; Cochrane, 2021b), the price level moves to restore the IGBC independent of monetary policy actions.

debt is stationary (in their setup, a violation of the NPGC would imply that it is not)[6] and by estimating a version of equation (4) directly (the NPGC implies that the coefficient on the first term should be zero). Wilcox (1989) constructs a 1960-1987 time series of the present value of U.S. debt discounted back to 1960 using ex-post realized holding returns; if the NPGC holds, this series must follow a stationary process. Trehan and Walsh (1991) focus on the stationarity of the first difference of the real value of debt (the NPGC implies that it should be stationary). Hakkio and Rush (1991) test for cointegration of total government spending and revenue (the NPGC implies cointegration).[7]

The results are mixed: Hamilton and Flavin (1986) and Trehan and Walsh (1991) conclude that the NGPC holds in the U.S., while Wilcox (1989) and Hakkio and Rush (1991) conclude that it is violated. Apart from the statistical techniques used, these mixed results could reflect the fact that the underlying sample is short (1960 until the late 1980s) and could include a regime shift following the 1980 election of Ronald Reagan (after which U.S. government indebtedness increased sharply). Hamilton and Flavin (1986) acknowledge this, and accordingly interpreted their inability to reject the NPGC not as evidence that U.S. deficits in the 1980s were sustainable, but rather that they were an aberration—requiring an impending return to surpluses. Consistent with this interpretation, Kremers (1989) finds that based on U.S. data between 1920 and 1982, the face value of U.S. debt and GDP are cointegrated, suggesting that the debt-to-GDP ratio stabilizes. He also finds a stabilizing feedback effect from real interest expenditures as a share of GDP to the growth rate of U.S. federal debt. But this feedback can no longer be detected after 1981. The question is whether this reflects an aberration, as hoped for by Hamilton and Flavin.

One way to answer this question is to see whether periods of U.S. history that look like the 1980s eventually turned out to be aberrations or not. In this spirit, Ahmed and Rogers (1995) examine very long time series for the U.S. (1795-1990) and the U.K. (1698-1987). They choose these long samples because they include several regime-changes (in response to events such as wars), identified as structural breaks in the short-run dynamics of fiscal variables. The question is whether the effects of these regime-shifts were permanent or only transitory. The authors test for cointegration between revenues, non-interest government spending, and interest spending and find strong support for cointegration; furthermore, the cointegrating vector is stable around the structural breaks in the short-term dynamics.

[6] When government debt provides services beyond the promise of future primary surpluses, the NPGC could be violated without rendering debt unsustainable (see Section 5).

[7] Additional papers in this literature include Trehan and Walsh (1988), Kremers (1988, 1989), (1991), and Smith and Zin (1991, using Canadian data). Haug

Intuitively, the tests pick up the ability of U.K. and federal-level U.S. government finances to "bounce back" from very large deficits without a debt restructuring or default (albeit with the help of inflation and financial repression in the decades after World War II, see Reinhart and Sbrancia 2015).

Unlike the earlier papers—which arrived at conflicting conclusions on whether fiscal policy was unsustainable at the time but did not speak to the question of whether feasible fiscal adjustment could correct the problem—Ahmed and Rogers (1995) can be interpreted as testing debt sustainability in the U.S. and U.K. Their results suggest that while fiscal policy in these countries may go through phases of unsustainable behavior, U.S. and U.K. policy institutions eventually do what is needed to ensure that the IGBC is satisfied. And indeed, the fiscal balance in the U.S. did briefly return to surplus in the second half of the 1990s.

3. The Bohn revolution and its aftermath

In the mid-1990s, Henning Bohn published two papers which revolutionized the academic literature on debt sustainability. The first, Bohn (1995), was an initially little-noticed theoretical contribution, which has been recently rediscovered and is playing a key role in the ongoing debate on how to think about debt sustainability when $r < g$ (see below). The second, Bohn (1998), proposed a stronger and more general way of testing for debt sustainability.

The main point of Bohn (1995) is that in an environment with uncertainty and risk averse consumers/investors, the NPGC (6) is incorrect, in the sense that it cannot be derived from individual optimization. Hence, the IGBC (5) may not be the relevant intertemporal budget constraint: in a stochastic environment, consumers/investors would not discount future income using the government borrowing rate.[8] Rather, they would apply a discount factor that reflects the marginal rate of substitution between a unit of consumption today and the future consumption that they expect to derive from investing this unit in government debt. Even if the debt is default-risk free, the debt's value in the secondary market, as well as the primary surpluses and utility that the consumer can expect to receive from holding the debt, will depend on the state of the economy. Since governments tend to run primary deficits in recessions (turning primary balances s_t into a procyclical variable) the stochastic discount

[8] As noted by Sims (1999) and Cochrane (2005), nominal debt gives the holder a residual claim to future primary surpluses—establishing an equivalence between government bonds and corporate *equity* (rather than corporate debt, which is not a claim to future profits). Just like it is inappropriate to discount Microsoft's future dividends at Microsoft's cost of borrowing, U.S. future primary surpluses should not be discounted at the U.S.'s cost of borrowing. Instead, the cyclical properties of the residual claim series (either dividends or primary surpluses) must be taken into account.

factor would normally exceed the government's borrowing rate—reflecting a "dividend stream" from holding government debt (the primary surplus) that is unattractive from an insurance perspective, as it pays out less in states of the world where marginal utility is high.

Assuming a representative consumer/investor with a time-separable utility function and constant discount factor $\beta \in (0,1)$, the government-borrowing rate-based discount factors $q_{t,j}$ in (4) can be replaced by "stochastic discount factors" involving the growth-adjusted marginal rate of consumption substitution across periods:

$$\tilde{q}_{t,t+j} \equiv E_t\left[\mu_{t,t+j} \prod_{h=t}^{t+j-1}(1+g_h)\right] \text{ with } \mu_{t,t+j} \equiv \beta^j \frac{U'(S_{t+j})}{U'(S_t)}, \tag{8}$$

where $U(\cdot)$ is the period utility function, and—as before—g is the growth rate of output (and, in the simplified economy considered by Bohn, the growth rate of consumption). Bohn (1995) shows that in a model with complete markets (a version of Lucas' (1978) stochastic endowment economy), the correct TVC can now be written as:

$$\lim_{n\to\infty} E_t\left[\tilde{q}_{t,t+n} b_{t+n}\right] = 0 \tag{9}$$

which leads to the "model-based" IGBC:

$$b_t = E_t\left[\sum_{j=1}^{n}\left(\tilde{q}_{t,t+j} s_{t+j}\right)\right] \tag{10}$$

To see how (10) compares to the IGBC (5), rewrite (10) as:

$$b_t = \sum_{j=1}^{n}\{E_t\left[\tilde{q}_{t,t+j}\right]E_t\left[s_{t+j}\right] + cov(\tilde{q}_{t,t+j}, s_{t+j})\} \tag{11}$$

Note that the risk-free interest rate r_j and the marginal rate of substitution $\mu_{t,j}$ are linked through the Euler equation $E_t\left[\mu_{t,t+j}\right] = \prod_{h=1}^{t+j-1}(1+r_h)^{-1}$. Substituting this in (8), using the resulting expression for $\tilde{q}_{t,t+j}$ in the first term of (11) and applying the definition of $q_{t,t+j}$ (the discount factor from equation (5)) gives:

$$b_t = E_t\left[\sum_{j=1}^{n}\left\{q_{t,t+j} s_{t+j} + cov\left(\tilde{q}_{t,t+j}, s_{t+j}\right)\right\}\right] \tag{12}$$

Unless $E_t\left[\sum_{j=1}^{n} cov\left(\tilde{q}_{t,t+j}, s_{t+j}\right)\right] = 0$ (future primary surpluses are uncorrelated with future marginal utility), (5) and (12) are not the same. And because the covariance of future marginal utility and future primary balances will generally be negative (marginal utility is higher in recessions, when governments tend to run deficits) the value of the debt predicted by (12) is generally lower than that predicted by (5). Hence, the model-based IGBC (12) generally implies a tighter constraint on sustainable debt levels than (5), the accounting-based IGBC.

Bohn (1998), his second major contribution, is the most widely cited empirical paper on debt sustainability. Like Kremers (1989), Bohn (1998) looks for feedback effects that might ensure debt sustainability, but he takes this idea a step further. Unlike the preceding empirical literature, which tested for fiscal sustainability by applying unit root or cointegration tests to fiscal time series, he runs a regression of the form:

$$s_t = \rho b_t + \varepsilon_t \tag{13}$$

where $\varepsilon_t$includes a set of controls. Because (as he argues) s_t and b_t are both stationary, this cannot be interpreted as estimating a cointegrating relationship. Instead, it is simply a model of the primary surplus that could be misspecified unless ε_t includes all relevant controls. Bohn argued that these controls should include measures of the business cycle (with recessions expected to lower the primary balance as a result of tax smoothing as in Barro (1979)) and temporary government expenditures such as wars (also expected to lower the primary balance). Using these controls, Bohn estimates ρ to be on the order of 0.05 (a 10 percent of GDP rise in the debt ratio leads to a rise in the primary balance by about half a percent of GDP).

Compared to the previous literature testing the IGBC (5), Bohn's strategy of asking whether $\rho > 0$ in (13) is a stronger and more general test of debt sustainability for two reasons.

First, it encapsulates a test of debt stabilization (i.e., equation (7)). To see this, substitute (13) in the debt dynamics equation (2) and solve for b_{t+1}. This leads to:

$$b_{t+1} = \left[\frac{1+r_t}{1+g_t}/(1+\rho)\right] b_t + \upsilon_{t+1} \tag{14}$$

with $\upsilon_{t+1} \equiv -\varepsilon_{t+1}/(1+\rho)$. (14) is mean-reverting as long as $\frac{1+r_t}{1+g_t} \approx 1 + r_t - g_t < 1 + \rho$ on average. With $\rho \approx 0.05$ and given that government borrowing rates have generally near or below the growth rate in the United States, the inequality holds.

Second, the feedback rule (13) with $\rho > 0$ implies that the IGBC is satisfied, not just in its deterministic version (5) but also in its stochastic version (10). Bohn (2008, 38) describes the intuition behind this result as follows (with the notation adapted to that used in this paper): "The idea of the proof is that debt growth is reduced by $1-\rho$ relative to a Ponzi scheme, reducing the n-period ahead debt by about a factor of $(1-\rho)^n$. For any (small) $\rho > 0$, this implies $E_t\left[\tilde{q}_{t,t+n} b_{t+n}\right] \approx (1-\rho)^n b_t = 0$." One implication is that Bohn's test "works" in samples in which (contrary to the assumption underlying the IGBC (5)) $r < g$ on average. Importantly, this finding relies on the relationship between the primary surplus and the debt ratio being at least linear for high debt levels ($f'(b_t) \geq \rho > 0$ for all $b_t \geq b^*$, where $s_t =$

$f(b_t) + \mu_t$). Hence, it is *not* necessarily satisfied if the relationship between the surplus and the debt ratio turns concave above some b^*.

The Bohn approach has been used to test debt sustainability in many countries and sample periods (Mendoza and Ostry, 2008; Mauro et al. 2015). While these papers confirm that Bohn's result holds for many countries, Mendoza and Ostry also find that the positive reaction of the fiscal balance to the debt ratio diminishes at higher debt ratios. In a paper motivated by the euro area debt crisis, Ghosh et al. (2013) explore this diminishing reaction in more detail for a group of 23 industrial countries, estimating non-linear relationships between the primary balance and the debt ratio. Their main result is that the positive relationship between the fiscal balance and the debt ratio weakens at high levels of debt and eventually turns zero or even negative, for example because it becomes increasingly difficult to find acceptable measures to cut spending/raise taxes once the low-hanging fruit has been implemented. They call this phenomenon "fiscal fatigue".

In an $r > g$ world, fiscal fatigue has strong implications for debt sustainability. As Bohn showed, if the primary balance linearly increases in debt, then debt is always sustainable. But if the relationship is concave, this implies a debt limit beyond which the primary balance cannot be raised sufficiently to stop debt from exploding. To see this, suppose that $s_{t+1} = \alpha + f(b_t)$, and assume that $f(b_t)$ is concave ($f'(\cdot) > 0$, $f''(\cdot) < 0$), so that $\alpha + f(b_t)$ intersects the schedule $\frac{r-g}{1+g}b$ twice for $b > 0$ (see Figure 2 in Ghosh et al. (2013)). The lower of these intersection points is the steady state debt level b^*. The higher intersection is the debt limit $\bar{b}$. This is reached when any further increase in the debt would lead to a primary surplus that is too small to stabilize the debt ratio:

$$\alpha + f(\bar{b}) = \frac{r-g}{1+g}\bar{b} \text{ and for any } b > \bar{b},\ \alpha + f(b) < \frac{r-g}{1+g}b \qquad (15)$$

As long as $b < \bar{b}$, debt converges to its steady state level b^*. But if a country experiences a bad shock (or a temporary period of fiscal irresponsibility) that pushes debt above $\bar{b}$, debt explodes—unless the country manages to undertake an exceptional fiscal adjustment effort (implying a period of higher primary balances than predicted by $\alpha + f(b)$) and/or is able to access finance at a lower than typical rate for some time, so that it pushes debt back below $\bar{b}$.

Based on a cubic approximation of $f(b_t)$ using 1985-2007 data, Ghosh et al. (2013) compute steady state debt-to-GDP ratios b^* and debt limits $\bar{b}$ for 18 advanced countries. Using projected interest rate-growth differentials, the median steady-state debt ratio is 49 percent, while the median debt limit is 186 percent. In five cases—Greece, Iceland, Italy, Japan, and Portugal—no steady state level debt level exists, given country-specific α and $r - g$

projections estimates and the $f(b_t)$ estimate (common for all countries). During 2008-2012, all of these countries except Japan suffered debt crises. In addition, actual $r - g$ turned out to be much lower than projected in most of these countries in the subsequent decade. While Ghosh et al. (2013) projected a median $r - g$ of 1.3 percent, the actual median $r - g$ in most advanced countries during 2013-2021 has been negative. We return to the implications of $r < g$ for debt sustainability in Section 5.

4. Assessing debt sustainability in the presence of rollover risk

The discussion so far has assumed that governments can borrow at rates reflecting economic fundamentals. The IGBC arithmetic, in particular, assumes that debt can be rolled over indefinitely. In practice this is not always the case: governments may lose market access at acceptable borrowing rates, including for non-fundamental reasons (such as a sudden shift in investor sentiment). The literature refers to this as "debt market panics", "pure liquidity crises", "rollover crises", or "self-fulfilling debt crises". The question is whether and how such rollover risk affects debt sustainability analysis.

One possible answer, implicit in the literature that we have surveyed so far, is that debt sustainability analysis does not need to worry about this, because it is by definition focused on government solvency, abstracting from liquidity problems. In this interpretation, debt sustainability analysis answers the question of whether governments can repay under the assumption that they maintain market access at rates reflecting their fundamentals. However, this answer is too easy from the perspective of many economies for whom rollover crises are a real possibility, particularly emerging market economies whose access to finance is often curtailed by "sudden stops" in international capital flows. In such cases, thinking through the implications of rollover risk is essential, because it could modify the conclusions of debt sustainability analysis with respect to sustainable debt levels and fiscal policies.

The possibility of self-fulfilling sovereign debt crises was first pointed out by Sachs (1984) and Calvo (1988). Sachs (1984) describes a canonical rollover crisis involving many creditors. Suppose that the debt which needs to be refinanced exceeds the sum of government cash reserves and the maximum feasible short-term fiscal adjustment, so that failure to roll over leads to default. Investors need to choose between rolling over or not. Conditional on other investors rolling over, it makes sense to roll over. But not rolling over is also an equilibrium: if investors expect the rollover to fail, then rolling over would expose them to additional losses (on their new exposure in addition to their old one).

In Calvo (1988), the government can repay its debts by raising tax revenues, but since that process brings distortions (which are increasing in the rate of taxation), the government has an incentive to default when its financing needs are sufficiently high. This leads to the coexistence of a "good" equilibrium (Pareto-efficient and default-free) with an inefficient "bad" equilibrium where debt is defaulted upon (see Figure 1). The blue solid line shows the government's optimal choice for θ, the share of debt being repudiated. This is increasing in its fiscal needs, which are in turn increasing in its borrowing cost (R_b). Below interest threshold $\underline{R}_b$, the government's financing needs are low enough that all of it can be raised through taxation—rendering $\theta = 0$ the optimal choice. The dashed red line shows the interest rate at which investors are willing to hold government debt, namely, the rate at which their ex-post return (net of any repudiated portion) is equal to the safe return, R_f. In equilibrium, the repudiation share chosen by the government conditional on the borrowing rate must be equal to the borrowing rate the investors demand conditional on the repudiated share. Hence, there is a "bad" equilibrium (in which part of the debt stock is being repudiated), located at the intersection of the two lines. At the same time, however, there is also a "good" equilibrium which is default free ($\theta = 0$) and where $R_b = R_f$. Which equilibrium prevails depends on investor expectations (disconnected from fundamentals).

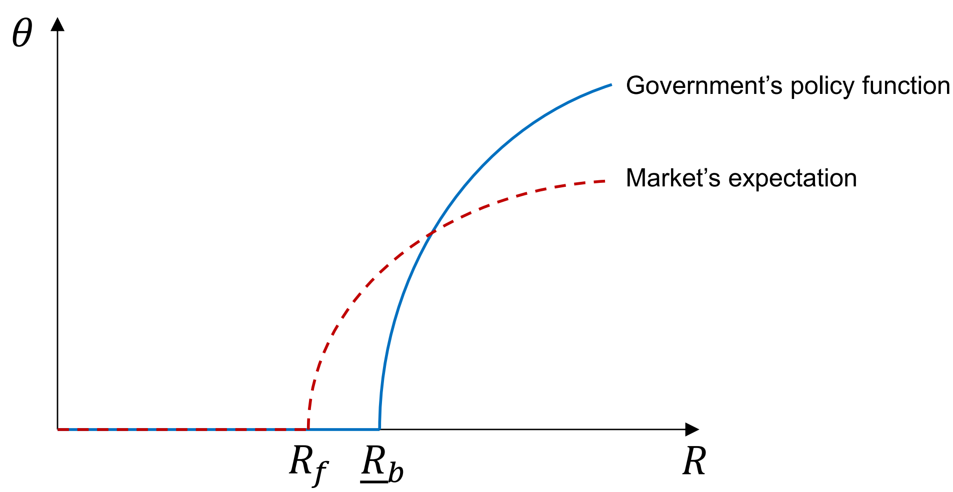

Figure 1: Graphical representation of Calvo (1988)

In a recent paper, Lorenzoni and Werning (2019) extend Calvo's model to a multi-period setting featuring long-term debt. Their model can generate "slow moving" debt crises—i.e., situations where bond yields (and hence marginal borrowing costs) rise sharply in response to a sentiment-driven switch to a "bad" equilibrium path, but the default takes a while to materialize. The reason is that the presence of long-term debt implies that the increase in marginal borrowing costs is slow to affect average borrowing costs and debt dynamics. This contrasts with rollover crises as in Calvo (1988), where a country fails to roll over its one-period debt, leading to an immediate default.

Based on these and related papers (see below) it is possible to draw some conclusions about the implications of rollover risk for debt sustainability, as well as policies or institutional arrangements that reduce rollover risk.

First, all models discussed so far imply that a sufficiently low level of debt eliminates rollover risk. For example, in Calvo's model, lower debt implies that the interest rate required to induce a repudiation of a given share θ is higher. Hence, the lower the level of debt, the flatter the blue schedule in Figure 1, to the point where the "bad" equilibrium may disappear. Another way of stating this is that in the presence of rollover risk, debt is only really safe at very low levels. How low? Calibrations by Blanchard, Huertas, and Kister (2021) suggest around 20 percent of GDP or less (see also Blanchard, forthcoming).

Second, as argued by Cole and Kehoe (1996, 2000), self-fulfilling crises are more likely to occur in countries that borrow at short maturities (since this creates a frequent need to roll over large amounts). Countries can therefore enhance their robustness by borrowing at longer maturities or by limiting their exposure to private, non-resident investors (who are most likely to run). This does not rule out "slow moving" crises a la Lorenzoni-Werning, whereby a sentiment shift immediately pushes up marginal borrowing costs. But the longer the average maturity of debt (implying a weaker connection between marginal and average borrowing costs), the slower the path towards eventual default, giving the country more time to turn things around by adjusting policies (or "gamble for redemption" by hoping for a positive shock).

Third, a central bank may be able to rule out the possibility of the self-fulfilling "bad" equilibrium. For example, in Sachs' (1984) coordination game, the central bank could act as a lender of last resort to the government. In Calvo's (1988) model, it could cap the sovereign's cost of borrowing below $\underline{R}_b$, so that the government would never be tempted to default, ruling out the "bad" equilibrium. This insight carries over to Lorenzoni and Werning (2019: 3250) and is also the focus of recent papers by Corsetti and Dedola (2016) and Camous and Cooper (2019). Another channel through which a central bank can reduce rollover risks is through asset purchase programs ("quantitative easing") that swap privately-held bonds of finite maturity for central bank reserves which do not need to be rolled over.

Importantly, however, two assumptions must be satisfied for the central bank to play this role.

- First, the central bank must be credible in the sense that it has control over the inflation rate and at least some control over real interest rates (see in particular Camous and Cooper 2019). If a central bank bailout of the government is expected to lead to high inflation, it could not rescue a sovereign from a Sachs (1984)-style rollover crisis, because investors would not want to hold newly issued debt whose value is expected to be eroded by high inflation. Without control over real interest rates, it could not hope to keep government borrowing rates below the threshold at which government may be tempted to default (as in Calvo 1988) and/or the debt dynamics become explosive (as in Lorenzoni and Werning 2019). And asset purchase programs consistent with the central bank's inflation objective are only possible to the extent that inflation expectations remain anchored. If this is not the case, the central bank would either have to reverse course, or let go of its inflation objective (in which case the IGBC is likely restored through high inflation).

- Second, the debt must be issued in domestic currency. This is not the case for many emerging market and developing economies, where both corporates and governments tend to borrow in foreign currency (usually, U.S. dollars). In such cases, the central bank may not be able to act as lender of last resort, because it may not have sufficient access to foreign currency liquidity. While it may be able to borrow such foreign currency from official lenders, its ability to do so is limited by the sovereign's creditworthiness (Jeanne and Zettelmeyer, 2002). Although a country with very solid economic fundamentals would have no problem accessing large-scale international liquidity (for example, through the IMF's Flexible Credit Line, or a swap line negotiated with the Federal Reserve), it is the less creditworthy countries that also tend to be exposed to rollover shocks.

Applied debt sustainability analyses conducted by policy institutions such as the IMF therefore take rollover risk into account in addition to solvency risk, as well as the feedback between the two. In the IMF's definition, "public debt can be regarded as sustainable when the primary balance needed to at least stabilize debt under both the baseline and realistic shock scenarios 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, 2013). For this reason, recent debt sustainability analyses at the IMF and in other policy institutions focus on flow concepts such gross financing needs as a share of GDP, rather than just the debt ratio, and try to quantify interest rate risk rather than just risk related to economic fundamentals (IMF, 2021).

5. Debt sustainability and fiscal risks when $r < g$

In his 2019 American Economic Association presidential lecture, Olivier Blanchard (2019) argued that very low real interest rates, and particularly real interest rates below real growth rates, lowered the costs of issuing public debt. Most of the lecture focused on the welfare costs of higher public debt, arguing that lower safe interest rates suggest a lower marginal product of capital, and hence lower welfare costs of crowding out. But in addition, he pointed out that based on actual U.S. government borrowing rates since 1950, debt rollovers would have been feasible in the sense that conditioning on a zero primary balance and starting from any year between 1950 and 1980, the debt ratio would have fallen by 2020. Therefore, with $r < g$ on average, "higher debt may not imply a higher fiscal cost."

While carefully phrased (in particular, to acknowledge the possibility that the relationship between r and g might reverse again in the future),[9] this claim felt provocative to many economists and policymakers. Several authors have since tried to push back, making two arguments.

First, as an empirical matter, higher debt creates fiscal risks even when $r < g$ (Mauro and Zhou, 2020; Moreno Badia et al., 2020), for example because higher debt levels increase rollover risks (as more debt needs to be refinanced). While $r < g$ helps to reduce the debt ratio, it does not seem to make a difference to the probability of suffering a rollover shock conditional on the debt ratio. Hence, Blanchard's point that with $r < g$, stabilizing the debt ratio may not require future fiscal adjustment is not inconsistent with the finding that $r < g$ does not reduce the risk of fiscal crises for a given debt ratio.

A second set of papers has argued that current debt levels in advanced economies raise fiscal sustainability concerns even when r is less than g on a sustained basis (Jiang et al. (2019), Olijslagers et al. (2020)). Unlike the findings described in the previous paragraph, this does challenge Blanchard's claims. In the remainder of this section, we focus on this dimension of the debate.

Although Blanchard (2019) did not claim that $r < g$ makes any fiscal policy sustainable, part of the reason for why Blanchard's lecture was viewed as provocative may be that his rollover exercises seemed to give legitimacy to an accounting-based view of debt sustainability which, if taken seriously, really does seem to imply that with $r < g$, virtually any fiscal policy is sustainable. To see this, suppose that s_t, r_t and g_t are constant over time. Equation (2) then becomes:

$$b_{t+1} = \frac{1+r}{1+g} b_t - s \tag{2'}$$

With $r < g$, $\frac{1+r}{1+g} < 1$, so (2') describes a difference equation that has a stable solution, namely $b = \frac{1+g}{r-g} s$. This means that for b to stabilize at a constant debt ratio, the primary balance s must be in deficit. To understand why, suppose that $s = 0$ and the debt ratio is at some positive level. With interest expenditures (adding to the numerator of the debt-to-GDP ratio) growing slower than output (adding to the denominator), the debt ratio will organically fall over time. Furthermore, b will stabilize at a constant debt ratio regardless of the level of the

[9] This point is elaborated by Chamon and Ostry (2021).

primary deficit. A larger primary deficit will merely lead to stabilization at a higher debt ratio. As long as the primary deficit does not keep rising over time (e.g., due to aging-related increases in the structural deficit), and as long as r remains below g, the debt ratio will always stabilize eventually. Hence, the debt sustainability definition given in equation (7) would be met.

Does this mean that when $r < g$, any primary deficit is sustainable, irrespective of the initial debt level? Clearly not. If we were to assume this, it would lead to all sorts of contradictions. For example, the steady-state primary deficit might exceed the size of the economy ($-s > 1$) and/or the size of the debt might exceed the value of all available private savings. In other words, there are constraints to debt sustainability that are simply not captured by the difference equation $b_{t+1} = \frac{1+r}{1+g} b_t - s$ and the steady state relationship $b = \frac{1+g}{r-g} s$ (Cochrane (2021a) offers more examples and reasons). How can we systematically think about these constraints?

One answer, given by Blanchard himself, is to quantify the reaction of government borrowing rates (and/or growth) to increases in debt (Blanchard et al., 2021; Blanchard, forthcoming). Even if default-risk premia are ignored, higher debt will raise real interest rates by crowding out investment. Starting from an initial situation where $r < g$, higher debt would push up r (and possibly lower g; see Lian et al., 2020), eventually reversing the relationship between r and g. At that point, fiscal adjustment is necessary to stabilize the debt.

However, there may be a more fundamental reason for why $r < g$ does not guarantee that debt is sustainable: namely, that debt sustainability is not determined by accounting relationships involving the (safe) government borrowing rate, but instead by a version of Bohn's "model-based" IGBC (10), in which discounting happens using stochastic ("risky") discount rates that could be substantially higher than government borrowing rates. Depending on how this IGBC looks exactly, Blanchard's contention that "higher debt may not imply a higher fiscal cost" may be wrong. Or it may be right, but for somewhat different reasons than argued by Blanchard.

Jiang et al. (2019) and Olijslagers et al. (2020) examine fiscal sustainability in the United States and the Netherlands, respectively, by testing a version of the model-based IGBC (12). Jiang et al. (2019) derive a version of (12) using arbitrage pricing theory, while Olijslagers et al. (2020) rely on a calibrated general equilibrium model a la Bohn (1995). Both use a VAR to estimate the cyclical properties of primary balances and stochastic discount factors using observed macroeconomic and asset price data. In both cases, the procyclical nature of primary balances implies average discount rates that are substantially higher than growth rates. For practical purposes, this looks like the $r > g$ world discussed before. There is no free lunch in the sense that running perpetual primary deficits—or even a perpetual primary balance of zero, as assumed in Blanchard's (2019) thought experiment—would violate the model-based IGBC. For positive market values of debt, the latter requires strictly positive future primary balances on average (assuming that primary balances continue to be procyclical).

A second group of papers, which includes Berentsen and Waller (2018), Brunnermeier et al. (2021), and Reis (2021), takes a different view. These papers—all cast within a setup of incomplete markets, where agents are not perfectly able to transfer wealth between different states of the world—argue that there might in fact be a free lunch for the government, because investors benefit from holding government debt for reasons that go beyond holding a claim to future primary surpluses. The argument, which goes back to Woodford (1990) and Holmstrom and Tirole (1998), is that purchasing government debt may be attractive to economic agents not only because it entitles the investor to future primary surpluses, but also because it is (i) liquid, in the sense that it can be sold (and converted into consumption) when needed, and (ii) safe, in the sense that it preserves its value when the investor (or the economy) is hit by a shock. While economic agents typically cannot pledge future income, they can buy and sell government bonds, which are in turn backed by a governmental promise to tax future income. This effectively offers a workaround to enable ordinary economic agents to borrow against their future income after all, helping them to smooth consumption over time.

As long as there is demand for such liquidity services (which is to say: as long as there is a collateral constraint that could become binding, rendering economic agents liquidity constrained), the value of government bonds includes the shadow value of expanding the set of consumption opportunities. In such an environment (or if holding government debt is needed to satisfy certain regulatory requirements), the government gets to enjoy a liquidity premium (also known as the "convenience yield"), enabling it to borrow at a rate below the social discount rate.[10]

The fact that government debt provides liquidity services enables an issuing sovereign to mine a (finite) bubble. Rather than having to satisfy the standard stochastic IGBC (12), which can be restated verbally as:

[10] Starting from Woodford (1990), Aiyagari and McGrattan (1998) and Angeletos et al. (2020) aim to find the optimum quantity of debt given associated liquidity services. In this case, it is socially optimal for the government to eliminate the financial friction by issuing debt until the liquidity premium has disappeared (much like the Friedman-rule for monetary policy; Andolfatto and Martin 2018). However, a desire for tax smoothing (which is facilitated by keeping sovereign borrowing costs suppressed) typically prevents governments from going all the way.

$$\textit{value of debt stock} = \mathrm{E}\{\textit{PV(future primary surpluses)}\}, \tag{16}$$

the government can now get away with satisfying the looser (but still bounded):

$$\textit{value of debt stock} = \mathrm{E}\{\textit{PV(future primary surpluses)}\} + \mathrm{E}\{\textit{PV(future service flow)}\}. \tag{17}$$

The big difference between (16) and (17) is that in (17), the TVC (9) no longer holds. Hence, there is a bubble in the sense that the presence of the service flow component implies that permanent primary deficits can be consistent with debt sustainability, even if the discount rate exceeds the rate of growth. Importantly, equation (17) will continue to put a limit on what stream of primary deficits is sustainable. Whether a particular fiscal policy is sustainable or not (for example, zero primary balances forever, as in Blanchard's rollover experiment), depends on the value of the service flow component. Jiang et al. (2019) estimate this to be worth about 65 percent of GDP on average during their sample period, not very far from the market value of U.S. debt at the time. Hence the notion that U.S. debt is sustainable conditional on a permanent primary balance of zero is not implausible.[11] Note, however that this would still require a large fiscal adjustment, even if the pre-pandemic (2019) primary deficit of about 3.5 percent is taken as the starting point (for 2020 and 2021, primary deficits are over 10 percent of GDP).

Is an adjustment of that magnitude feasible? If so, as argued by the IMF (2021b), then U.S. debt is sustainable (but not current U.S. fiscal policy). If not, U.S. debt is unsustainable, but markets have not yet taken notice.

6. Concluding thoughts: central bank credibility as a fiscal asset

The literatures discussed in Section 4 and at the end of Section 5 suggest several channels through which central bank credibility could expand a sovereign's debt carrying capacity and ability to conduct countercyclical fiscal policy. As discussed in Section 4, central bank credibility is essential to prevent rollover crises, and hence raises the level of sovereign debt that can be safely issued by a government. This point has been made and understood at least since Calvo (1988). In the framework of the expanded stochastic IGBC (17), this has an effect on the first term on the right-hand side, via a lower default premium embedded in the government borrowing rate.

[11] In addition, Jiang et al. (2019) may be too conservative in their calibration of convenience yields. They base it on the yield spread between Treasuries and triple-A-rated corporate bonds. But if the latter also have safe asset characteristics (which is not implausible), part of the true convenience yield is differenced out.

But in addition, central bank credibility could expand a sovereign's fiscal space through several additional channels, which have to do with the impact of central bank operations on the second, "service flow" term of the IGBC (17).

- Countercyclical monetary policy—cutting rates in recessions—allows investors to make capital gains on fixed-rate, longer-term bond holdings in downturns, when marginal utility is high. This gives government debt a cyclical insurance property. It turns government debt into a "negative beta" asset, which investors would want to have in their investment portfolio because it helps them hedge (Brunnermeier et al., 2021; Cochrane, 2021a).[12] Credibility helps by making it easier for central banks to control real interest rates and to cut rates in recessions (which is difficult for a non-credible central bank that must constantly worry about de-anchoring inflation expectations, particularly following negative supply shocks).
- Beyond contributing to the safety of government debt (both by reducing rollover risk in the primary market, and by turning debt into a "negative beta" asset), central banks can raise the service flow of holding debt by creating and ensuring liquidity in the secondary market. This happens through two channels. First, ex ante, through market development. Starting with at least Jeanne (2003), it has been recognized that central bank credibility (in the sense of expected stability of inflation) is an essential condition for the development of local-currency debt markets (see also EBRD 2010, Du et al. 2020, and Engel and Park forthcoming). Second, ex post, through the ability of the central bank to prevent the secondary market from "freezing" in a crisis. This works only if the central bank is able to function as "market maker of last resort" (guaranteeing the claim's liquidity even under stressed circumstances), which in turn is possible only if it can inject liquidity into the market without "de-anchoring" inflationary expectations.

With widespread use of inflation targeting, central bank credibility has indeed risen in many countries in recent decades. In parallel, sovereign debt has become more liquid over the years, with it increasingly being held as a form of wholesale money (Andolfatto and Martin, 2018) while its demand for regulatory purposes has increased as well (Andolfatto (2021)

[12] The countercyclical nature of capital gains, and hence the "negative beta"-status, may be boosted further if investors collectively coordinate upon considering such debt "safe" and wishing to acquire this safe asset during downturns. This self-fulfilling feature is fragile though and any current "safe haven" may lose its status as a result of over-indebtedness (Farhi and Maggiori, 2018).

points to Basel III and the Dodd-Frank Act). Taken together, this suggests that many countries should now be able to sustain higher debt levels than decades ago.[13]

Seen through this lens, it also becomes clear that advanced and emerging/developing economies (EMDEs) may not enjoy equal privileges. Central bank credibility—the ability to maintain inflation expectations anchored around a low inflation target—tends to be lower in the EMDE group. This will limit the ability of their central banks to prevent rollover crisis in the primary market, reduce their capacity to lower rates during downturns (especially if driven by supply-side factors), prevent the development of deep secondary debt markets in local currency, and constrain their ability to act as market makers of last resort to prevent these markets from seizing up in a crisis.[14] For all these reasons, EMDE government debt may be less valued as a safe and liquid asset. This implies a tighter fiscal constraint: for a given value to investors, debt must be expected to lead to higher future primary surpluses.

These considerations suggest that central bank credibility can function like a fiscal asset. It can be seen as a form of reputational capital, accumulable over time by establishing a record of low and stable inflation (which may in turn require a responsible fiscal policy which refrains from using the central bank as an ATM).[15] Once accumulated, this capital can subsequently be relied upon to relax fiscal constraints. Importantly, however, central bank credibility is finite and depletable, to be relied upon in moderation. If debt and deficits exceed the envelope that is defined by equation (17), this could destroy the premises on which credibility is built.

[13] At the same time, a separate force has been working in the opposite direction: as argued by Rogoff (2021), statistical notions of debt have become less representative of true fiscal burdens—with many governments facing larger "junior" types of non-market liabilities, such as future pension and health care obligations.

[14] Of note, however, several EMDE central banks (including Guatemala, Indonesia, and The Philippines) did engage in government bond purchases following the onset of the COVID-pandemic, without generating runaway inflation or exchange rate collapse. This suggests that these central banks entered 2020 with enough reputational capital to ease policies significantly when the pandemic hit, helping the associated treasuries to provide more fiscal stimulus.

[15] This message is challenged by proponents of "Modern Monetary Theory" (MMT; Kelton, 2020), but this ignores the fact that ability to issue debt in local currency requires monetary policy credibility (Farhi and Maggiori (2018) make this point in relation to reserve currency status).

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