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Sovereign risk

18 March 2011

Government debt has increased sharply in most developed countries in the wake of the financial crisis. The increased debt burden comes on top of an expected surge in debt due to demographics. Sharpened by the European peripheral debt crisis, this has led to increased focus on the risk associated with investing in government debt. This section reviews measures of this risk and discusses possible implications for investment returns.

Main findings

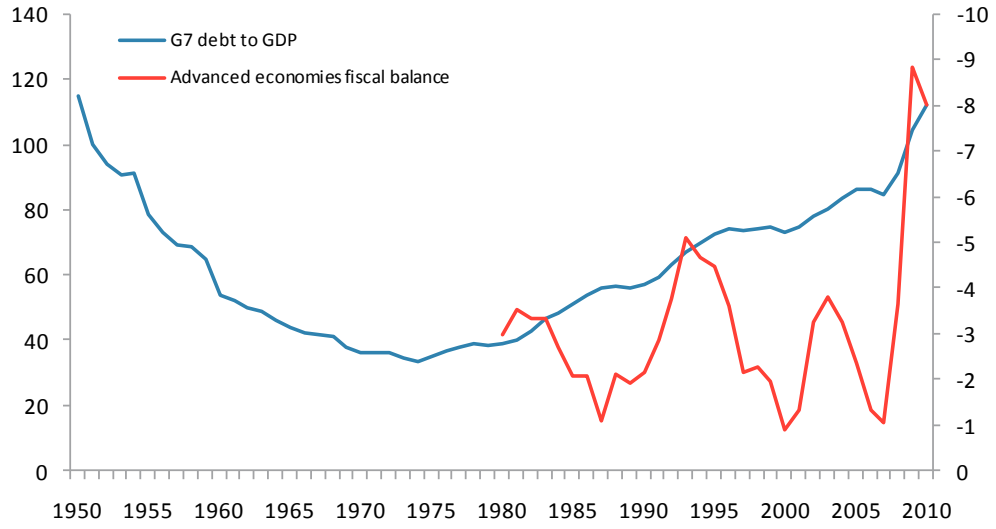
- A continuation of current policies in most developed countries is unsustainable. This is mainly due to today's high debt-to-GDP ratio and an ageing population incurring costs in the future.
- In order to bring the debt-to-GDP ratio onto a sustainable path, governments need to change policies, default on debt or expropriate assets. The mix of th options a government chooses will have implications for investment returns
- Empirical evidence shows that governments historically have both defaulted on debt and expropriated assets, but usually opt to change fiscal policies.
- Constructing measures that predict when governments will choose the default-on-debt option is challenging. In developed economies, validating such a measure empirically would in any case be difficult since defaults are almost non-existent.[1] As a group, developed economies are, however, in a new situation: the debt-to-GDP ratio is higher than ever previously observed and significant policy changes are needed to make policies sustainable (IMF 2010a).
- Some indicators, albeit noisy, do indicate that the default risk on government debt in developed economies has increased, and it should be noted that even a small increase in this default probability can change the way investors construct portfolios and price risk: the premise that a risk-free investment exists, which is an important building block in portfolio theory and management, may no longer be valid (Damodaran 2010).
- Even if we still judge the risk of outright defaults on government debt in the developed economies as fairly small, the high and increasing debt levels may imply a weak real return outlook in developed countries.[2]

1 The last defaults in the industrial world were Japan and Germany in the immediate aftermath of World War II (Reinhart and Rogoff 2008).
2 Reinhart and Rogoff (2010) find that a high debt-to-GDP ratio is associated with low real economic growth.

Is a continuation of current policies unsustainable?

The chart below is based on IMF data and shows developments in G7 debt-to-GDP and fiscal balance in advanced economies on the left- and right-hand scales respectively. Debt is approaching levels not registered since the early 1950s when these countries were recovering from World War II. Record-high fiscal deficits suggest that the debt-to-GDP ratio will rise further over the next few years. This development has fuelled discussions of whether a continuation of current policies is sustainable.

Figure 1: G7 debt-to-GDP and fiscal balance in advanced economies



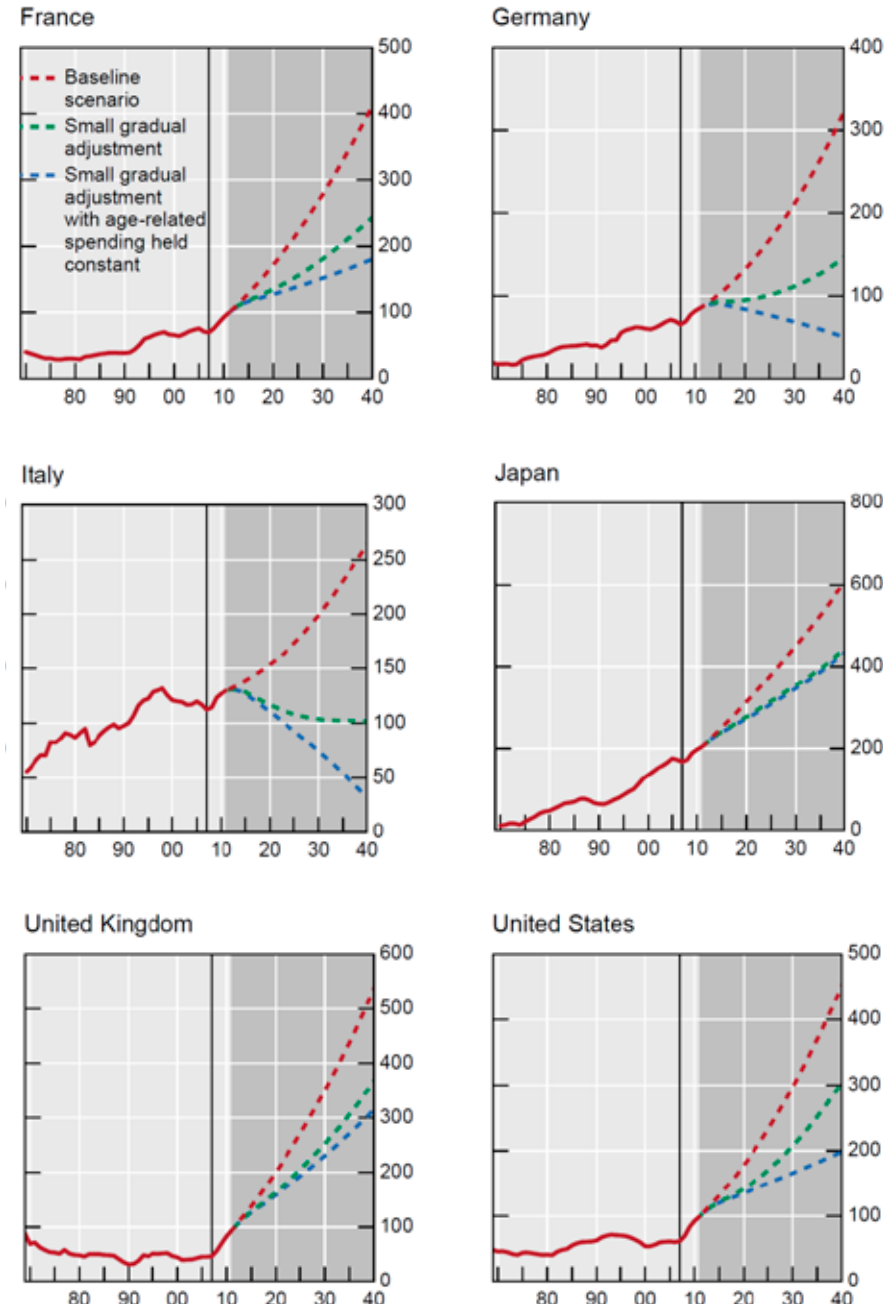
Source: IMF

It is difficult to determine whether a continuation of current policies is unsustainable, not least since it involves assessing uncertain future tax revenues and expenditures. In a recent paper from the BIS, Cecchetti, Mohanty and Zampolli (2010) project the path of the debt-to-GDP ratio in several major developed countries for the coming 30 years. In the baseline case, they assume that government revenues and non-age-related primary spending remain a constant share of GDP at the 2011 level as projected by the OECD. They then use the Congressional Budget Office and European Commission projections for age-related spending to generate a path for total primary government spending (total spending excluding the interest bill on outstanding debt).

They make two further assumptions: the real interest rate on government debt is assumed to be at its 1998-2007 average, and potential real GDP growth is set equal to recent OECD estimates. They then compute the primary surplus and debt as a percentage of GDP over the coming 30 years (the red line in Figure 2). Note that, for most of the countries, debt as a share of GDP will roughly triple from today's historically high levels, and the path does not show any sign of flattening out, leading the authors to conclude that a continuation of current policies is unsustainable. This is not a controversial conclusion: see also IMF (2010a), European Commission (2009) and de Mello and Padoan (2010).

The BIS paper also computes debt-to-GDP under two new policies. First, it is assumed that the primary surplus as a share of GDP improves by 1 percentage point each year for the next five years (the green line in Figure 2), and then, in addition, age-related spending relative to GDP is kept constant at the projected 2011 level (the blue line in Figure 2). Even after these significant changes, the authors find policies to be unsustainable in some countries.

Figure 2: Debt-to-GDP projections



Source: Cecchetti, Mohanty and Zampolli (2010)

The government's budget constraint

This subsection defines theoretically what it means for a continuation of current policies to be unsustainable and explores the options available to government for bringing policies onto a sustainable path. The simplified budget constraint facing a government can be written as

$$G_t + (A_t - A_{t-1}) + i_{Bt}B_{t-1} = T_t + i_{At}A_{t-1} + (B_t - B_{t-1}) + (M_t - M_{t-1}) \quad (1)$$

where G_t is government expenditures, A_t the government's assets, i_{Bt} the interest rate on the government's (nominal, local currency[3]) debt, B_t, and M_t is the outstanding money stock, all in period t. The budget constraint simply says that, for every period, the government's expenditures and investments (increase in assets) and the interest bill must be financed by its tax revenues, interest/dividends on its assets, debt issuance and/or an increase in the money stock.

Even without discussing the government's preferences, we can make a few observations from this problem. First, the amount of debt a government issues in one period depends on many variables, of which several may be associated with uncertainty: G_t, T_t and i_{At}. Furthermore, there are alternatives to issuing debt to cover any shortfall of revenues to expenditures – disinvestments or printing money.

In most developed countries, the money stock is under the control of an independent central bank. For the time being we will ignore the possibility of increasing the money stock. We will, however, return to this later given the current conduct of unconventional monetary policy. We also assume that $i_{Bt} = i_{At} = i$ – the interest rates on debt and investments are equal to a constant. Given these assumptions, we can sum the intertemporal budget constraint (1) over all periods to get

$$\sum_{t=0}^{\infty} \frac{1}{(1+i)^t}(G_t - T_t) = (A_0 - B_0) \quad (2)$$

which simply says that in any initial period 0, the net present value of current and future government expenditures over tax revenues has to be equal to initial net wealth – the difference between the government's assets and debt in period 0.

A continuation of current policies implying present and future expenditures, G_t^*, and taxes, T_t^*, is unsustainable if

$$\sum_{t=0}^{\infty} \frac{1}{(1+i)^t}(G_t^* - T_t^*) > (A_0 - B_0) \quad (3)$$

The government can then change policies by cutting expenditures, spending less than G_t^*, and/or collecting more taxes than T_t^*, e.g. by increasing the tax rates. Another possibility is to default on the debt, reducing B_0, and/or to increase its assets, A_0, e.g. through expropriation. The key point is that some measures will be taken (at some point) to restore equality in (3). Which measure will be taken may vary across both countries and governments.

Assessing whether a country is in a situation described by (3) is a challenging task. First, it involves making projections of government expenditures and tax revenues under a continuation of current policies. Second, it involves valuing the government's assets, many of which may not be traded in a marketplace. In addition, since governments may differ in their response to such a situation, assessing the probability that a government will choose to default on its debt is not straightforward. Consequently the credit rating agencies use a range of factors in their assessments of this probability (IMF 2010b), including the state of the government's finances.[4]

For a long-term investor, observing a situation described by (3) should raise some concerns since current investments may be hurt: investments in government bonds may lose value if the government chooses to default on its debt; foreign direct investments may be targeted if the government chooses

3 We do not discuss in length the distinction between debt issued in foreign and local currency. Note, however, that throughout history we find examples of countries that have defaulted on both local and foreign currency debt simultaneously, local currency debt only and foreign currency debt only, though the last of these takes place most frequently (see Damodaran 2010 for more details).

4 Damodaran (2010) concludes that all of the ratings agencies seem to have, on average, delivered the goods in terms of measuring default risk.

expropriation as the solution. Even if the government opts for a change of policies, investments may be affected: for example, increasing corporate tax rates may be bad for equity investments in general and reducing government expenditures may involve cutting subsidies and consequently lower the equity value of companies relying heavily on such support.

Debt levels are often the starting point when considering a government's finances. To enable comparisons across time and countries, debt is usually measured as a share of GDP.5 We can write debt, the primary surplus (the difference between tax revenues and government expenditures), the money stock and the interest bill as a share of nominal GDP in period t as

$$b_t \equiv \frac{B_t}{Y_t}, \quad p_t \equiv \frac{P_t}{Y_t} \equiv \frac{T_t - G_t}{Y_t}, \quad m_t \equiv \frac{M_t}{Y_t} \quad l_t \equiv \frac{iB_{t-1}}{Y_t}$$

Nominal GDP grows at a rate δ_t

$$Y_t = Y_{t-1}(1 + \delta_t) = Y_{t-1}(1 + \pi_t)(1 + g_t),$$

where p_t is inflation and g_t is real GDP growth, all in period t.

If we now return to (1) and simplify it by ignoring the government's assets, A_t, debt to nominal GDP can be written as

$$b_t = -p_t + l_t + \frac{1}{1+\delta_t} b_{t-1} - (m_t - m_{t-1}) - \frac{\delta_t}{1+\delta_t} m_{t-1} \tag{4}$$

If we assume that the money stock and nominal GDP grow at the same rate, which is a simplified version of Friedman's quantity theory of money (Friedman 2008), then $m_t = m_{t-1} = m^*$ – a constant – and (4) simplifies to

$$b_t = -p_t + l_t + \frac{1}{1+\delta_t} b_{t-1} - \frac{\delta_t}{1+\delta_t} m^* \tag{5}$$

We find that the higher the nominal growth in the economy, δ_t, the easier the "debt burden", all else equal. Debt as a share of GDP becomes smaller the higher the nominal GDP growth rate, through two channels. The obvious one is that the denominator grows faster. The other is due to higher returns on seigniorage $\frac{\delta_t}{1+\delta_t} m^*$. The stronger the nominal GDP growth, the more money will be in circulation, money on which the government does not pay any interest. Consequently the government can print more money instead of issuing more debt to cover some of its expenditures.

Higher nominal growth through higher real growth has few disadvantages, but the government can also consider letting inflation rise to ease the debt burden. This may hurt real growth (Barro 1996) and it may be in conflict with stated monetary policy targets such as inflation targeting. Consequently the degree of independence of the central bank and the targets of the central bank may be factors determining how governments choose to service their debt.

The real interest rate the government pays on outstanding fixed-rate nominal bonds would also be lower with higher inflation, easing the real burden further. This is a temporary effect, though, since one would expect the nominal interest rate on new issuances of debt to rise with the increase in the inflation rate. Should governments follow the route of letting inflation rise, investments in real government bonds or other real assets should be preferred over investments in nominal government bonds.

From (5), ignoring seignorage altogether, $m^* = 0$, it also follows that for debt-to-GDP to be stable when the primary budget is balanced, $b_t = b^*$ and $p_t = 0$, the nominal growth rate has to be equal to the nominal interest rate on the outstanding debt, $\delta_t = i$. Another section of this enclosure, entitled "Yields and prospective real returns in fixed income", illustrates the effects on debt-to-GDP of the time-varying difference between the nominal growth rate and the nominal interest rate, and discusses a government's ability to achieve low real rates.

5 The resources available to service the debt are not GDP, but rather tax revenues or the potential tax revenues both of which are only a fraction of GDP. This fraction may also vary across time and countries.

Empirical evidence of defaults and expropriation

We have argued that a continuation of current policies in several developed countries is deemed unsustainable, and we have discussed in theory what governments in such countries can do. The focus in this subsection is on what the empirical evidence says about what governments in similar situations have chosen. Should we expect governments to default on their debt or expropriate assets instead of changing policies sufficiently?

To start, defaults and expropriations are rare in developed economies. The latest defaults in the developed world were Japan and Germany in the immediate aftermath of World War II (Reinhart and Rogoff 2008). Back then, government debt as a share of GDP was above 100 percent, as now, in several countries. What is new about the current situation is that total government debt as a share of GDP in the OECD countries is expected to reach 100 percent of GDP for the first time. For the G7, the debt-to-GDP ratio is roughly back at the elevated level after World War II (see Figure 1). The fact that several countries have high indebtedness simultaneously makes policy changes cutting expenditures and increasing tax revenues more costly (IMF 2010c).

If we look at a broader sample than only the developed countries, we do find both defaults and expropriation of foreign direct investments. These two combined are called sovereign theft in Tomz and Wright (2010), who define default and expropriation as follows:

Default

A default occurred whenever a country failed to pay interest or repay principal within the allowable grace period. We also regarded a country as having defaulted if, in the case of sovereign bonds, it made an exchange offer that contained terms "less favorable than the original issue".

Expropriation

(1) Nationalization, defined as action by a government to take ownership of a foreign firm;

(2) Coerced sale, in which the government threatens or takes actions that induce foreigners to sell part or all of their direct investments to the government or to domestic citizens;

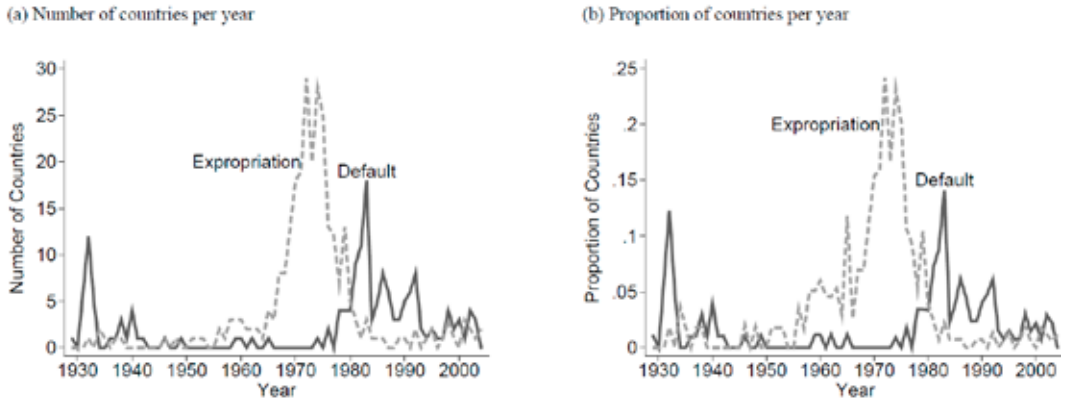
(3) Intervention or requisition, in which the government takes control of foreign direct investments without proclaiming itself the rightful owner; or

(4) Renegotiation, in which the government compels direct investors to accept substantial changes in a contract or a concession.

Tomz and Wright construct a data set covering more than 150 countries from 1929 to 2004. They find that expropriation was widespread in the 1970s, where such acts were taking place in almost 30 of the countries, or nearly 25 percent of the sample, at their peak (see Figure 3). Defaults on debt were more prevalent in the 1980s, with a peak of almost 20 countries, or 15 percent of the sample. Combined, some form of sovereign theft took place globally almost every year over the sample period (1929-2004).

Looking closer at individual countries, Tomz and Wright find that countries tend to either both expropriate and default (but not necessarily at the same time) or take part in no sovereign theft whatsoever.

Figure 3: Sovereign theft in history



Source: Tomz and Wright (2010)

How often have *defaults* been chosen as a solution when a continuation of current policies is deemed unsustainable? One approach is to assume that a sovereign bond spread above 1,000 basis points signals that a continuation of current policies at a given point in time is unsustainable, since market prices then assign a non-negligible probability to default as the chosen option for the government. A recent IMF Staff Position Note (Cottarelli, Forni, Gottschalk and Mauro 2010) finds incidents of emerging economy sovereign bond spreads above 1,000 basis points and investigates how many of these incidents were followed by a default. They find that only seven out of 36 incidents ended with a default. This indicates that governments usually do not default when a continuation of current policies is unsustainable. This even applies to governments of countries with a history of default.

When do countries default on sovereign debt?

Is there any way of predicting when a default will take place? Cottarelli, Forni, Gottschalk and Mauro (2010) conclude when looking at default episodes in all emerging economies since 1976 that:

The economies that defaulted in recent decades did so primarily as a result of high debt servicing costs, often in the context of major external shocks.

They also compare the characteristics of those episodes with the characteristics of today's situation in selected developed countries. Their findings are summarised in the table below:

Table 1: Decomposition of debt dynamics, advanced economies and default episodes (percent of GDP)

		Primary Balance (1)	Nominal Interest Bill (2)	Capital Loss due to Nominal Devaluation (3)	Inflation Correction (4)	Total (Real Interest Bill) (5)=(2)+(3)+(4)	Real Growth Contribution (6)	Debt/ GDP
Advanced Economies (Averages for 2009 - 2010)	France	-5,9	2,5	...	-0,4	2,1	0,2	80,8
	Greece	-5,5	5,3	...	-2,1	3,3	2,2	106,9
	Ireland	-10	2,4	...	1,3	3,8	2,2	71,7
	Italy	-0,8	4,6	...	-2	2,7	2,3	117,2
	Japan	-8,7	2,9	...	2,8	5,7	3,3	222,4
	Netherlands	-3,6	2,4	...	-0,3	2,1	0,8	61,9
	Portugal	-6,1	3,1	...	-0,7	2,4	0,8	81,9
	Spain	-9,4	2,1	...	0	2,1	0,9	61,1
	United Kingdom	-9	2,6	...	-1,2	1,3	0,9	73,2
	United States	-10	2,7	...	-0,7	2	-0,4	87,9
	Median	-7,4	2,6	...	-0,6	2,3	0,9	81,3
Emerging Economies (Averages for the two years prior to default)	Argentina (2002)	-0,5	4,4	0	0	4,4	1,2	44
	Ecuador (1999)	0,6	4,3	0	-1,3	3	-1,6	65,1
	Indonesia (1999)	0,3	2	31,6	-10,5	23,1	1,9	35
	Jamaica (2010)	0,9	9,4	7,6	-10,4	6,6	2	104,5
	Mexico (1982)	-4,5	3,8	0,1	-4,1	-0,2	-1,7	21,4
	Moldova (2002)	4,5	5,3	6,8	-14,6	-2,6	-3,7	93,9
	Pakistan (1999)	-0,2	5,7	4,6	-6,9	3,4	-1,3	74,4
	Russia (1998)	-9,9	5	3,7	-10,1	-1,4	0,5	44,2
	Ukraine (1998)	-2,1	2,1	2,9	-4	1	0,8	30,6
	Uruguay (2003)	-1,3	3	15,4	-4	14,3	2,9	49,7
	Median	-0,4	4,3	4,1	-5,5	3,2	0,7	46,9

Source: Cottarelli, Forni, Gottschalk and Mauro (2010)

Notes: The default episodes (the year of default is reported in parenthesis next to the country name in the first column) include all emerging economies defaulting since 1976 for which there are available data to compute the decomposition.

Three variables are highlighted in the table: the primary balance, the nominal interest bill and the debt ratio. These can be related to three time-varying right-hand-side variables in equation (5).

The authors' conclusion is that it is mainly the nominal interest rate bill, I_t, that stands out as high in the default episodes (lower half of the table above). However, it matters greatly whether the nominal interest rate bill is high due to a high debt-to-GDP ratio or a high nominal interest rate. For a long-term investor, the latter case is less alarming since compensation for the given default risk is higher.6 Second, the primary surplus, p_t, tends to be close to zero. Inspecting the table reveals considerable heterogeneity, however. Lastly, the debt-to-GDP level, p_{t-1}, does not seem to be a good predictor of default.

6 This is related to the findings in Damodaran (2010), who argues that the interest rate spread (the difference between the interest rate on debt issued in foreign currency (e.g. USD) and assumed risk free debt issued in the same currency (e.g. US Treasuries) is correlated with the default risk.

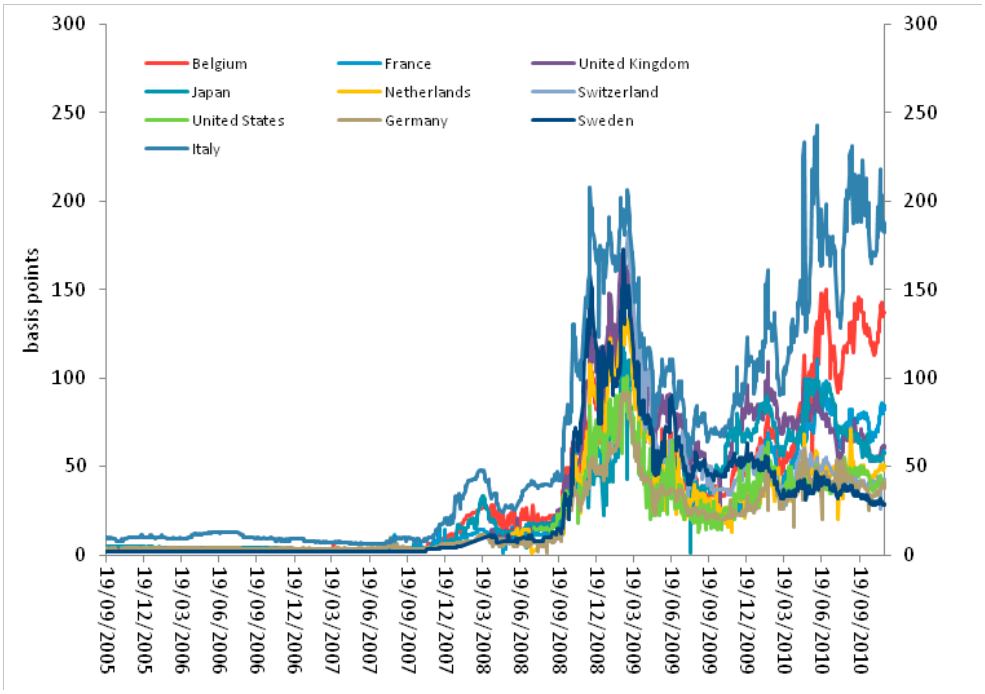
Comparing the default episodes with the situation of today in industrial countries (upper half of the table above), neither the primary surplus nor the nominal interest rate bill have the "typical" default value. Debt-to-GDP is high, but the evidence from the default episodes suggests that this says little about the probability of default.

As Cottarelli, Forni, Gottschalk and Mauro (2010) state, defaults take place "often in the context of major external shocks". Shocks are hard to predict7, and even if one could, this would not suffice to predict defaults accurately. To quote Tomz and Wright (2007):

Throughout history, countries have indeed defaulted during bad times, but they have also maintained debt service in the face of severe adverse shocks, and they have defaulted when domestic economic conditions were highly favorable. This pattern is puzzling, not only because it seems inconsistent with the conventional wisdom that countries default in response to adverse economic conditions, but also because it stands at odds with prominent models in which default provides costly insurance against economic adversity.

Another approach to assessing the probability of defaults is to use the market of credit default swaps (CDSs) for sovereigns where investors try to put a price on the default risk and trade at that price. This approach has its limitations since it does not say anything about why the default risk is at a given level. Additionally, exposure to counterparty and liquidity risk in this market can cause changes in CDS prices that have nothing to do with changes in default risk. One of the conclusions in Damodaran (2010), however, is that "*the evidence, at least as of now, is that changes in CDS prices provide information, albeit noisy, of changes in default risk*". Figure 4 shows that CDS prices for several developed economies have increased considerably, indicating that the discounted default probability has increased.[8]

Figure 4: Five-year credit default swap prices



Source: Bloomberg, November 18, 2010

7 See Hatchondo, Martinez and Sapriza (2007) for a survey of different types of shocks that can lead to a sovereign default.

8 In general, to compute the default probability associated with a given CDS spread, the calculation requires an iterative numerical procedure. In the case of a flat CDS curve, however, the default probability to a time measured in years from the valuation date equals approximately 1-e^(-S * t/(1-R)), where S is the flat CDS spread and R is the recovery rate. Setting t=5 and R=40 percent, a CDS spread of 1.8 percent (Italy) and 0.6 percent (UK and Japan) gives default probabilities of 13.9 percent and 4.9 percent respectively.

What if nothing is risk-free?

The presence of (a non-negligible) default risk in developed economies' government bonds may have far-reaching consequences. Damodaran (2010) argues that only government bonds have the potential of being a risk-free investment, and if they now all have a perceived positive default probability, a risk-free investment no longer exists. Many of the results from portfolio theory and management, which use a risk-free investment as a building block, would no longer be valid. Damodaran argues that this may have consequences for investor behavior and result in less diversified portfolios and higher risk premiums.

Less diversified portfolios:
Without a riskless asset available for adjusting risk, investors have to tailor portfolios to their specific risk needs. In practical terms, this would require investors who want to bear more (less) risk holding stocks in the riskiest (safest) sectors and avoiding safe (risky) companies… Both groups will give up some diversification when they do so, resulting in less efficient risk bearing overall.

Higher risk premiums:
Building on the theme of less efficient risk bearing, the absence of a riskless investment will make risky investment seem even riskier to all investors. … Investors may invest less in risky assets, demand higher risk premiums (and pay lower prices) and be quicker to flee these assets in the face of danger. … As a consequence, we can expect to see lower prices for all risky assets, higher volatility in prices in these markets and abrupt, painful market corrections.

Sovereign debt, economic growth and inflation

A high debt-to-GDP ratio may have wider consequences than possibly increasing the default risk as discussed in the previous sections. Reinhart and Rogoff (2010) find that a high debt-to-GDP ratio is associated with low real economic growth, and hence potentially a low real return on investments. Some of their findings are summarised in the tables below taken from their paper.

The first thing to note is that a debt-to-GDP level above 90 percent is associated with significantly lower real growth than lower debt levels. The second is that this finding is remarkably stable. It holds both looking at advanced and emerging economies separately, and looking at only a post-World War II sample for both these groups. It does not hold for every single country, though, but high-growth high-debt observations in the advanced economies are clustered in the years following World War II.

Inflation is not found to increase significantly with the debt-to-GDP level in advanced economies as a group. It is the case in the US, though, and in the group of emerging economies. This lends some support to the conclusion that advanced economies do not have a history of increasing inflation to ease the debt burden.

Note that these results do not say anything about causality. This is just an empirical regularity. Whether it is the high debt-to-GDP ratio that leads to low growth or another factor leading to both, a high debt-to-GDP ratio may signal low real growth and a low real return going forward.[9] With the group of developed countries having a debt-to-GDP ratio of around 100 percent, this may have implications for regional asset allocation. We could also interpret the findings as an indication that it is challenging to enhance real growth to ease the debt burden.

9 This is exactly what market prices currently indicate. As discussed in the section "Yields and prospective real returns in fixed income", current real yields are close to historical lows.

Table 2: Real GDP growth as the level of government debt varies: selected advanced economies 1790-2009 (annual percentage change)

		Central (Federal) government debt/ GDP			
Country	**Period**	**Below 30 percent**	**30 to 60 percent**	**60 to 90 percent**	**90 percent and above**
Australia	1902-2009	3,1	4,1	2,3	4,6
Austria	1880-2009	4,3	3	2,3	n.a.
Belgium	1835-2009	3	2,6	2,1	3,3
Canada	1925-2009	2	4,5	3	2,2
Denmark	1880-2009	3,1	1,7	2,4	n.a.
Finland	1913-2009	3,2	3	4,3	1,9
France	1880-2009	4,9	2,7	2,8	2,3
Germany	1880-2009	3,6	0,9	n.a.	n.a.
Greece	1884-2009	4	0,3	4,8	2,5
Ireland	1949-2009	4,4	4,5	4	2,4
Italy	1880-2009	5,4	4,9	1,9	0,7
Japan	1885-2009	4,9	3,7	3,9	0,7
Netherlands	1880-2009	4	2,8	2,4	2
New Zealand	1932-2009	2,5	2,9	3,9	3,6
Norway	1880-2009	2,9	4,4	n.a.	n.a.
Portugal	1851-2009	4,8	2,5	1,4	n.a.
Spain	1850-2009	1,6	3,3	1,3	2,2
Sweden	1880-2009	2,9	2,9	2,7	n.a.
United Kingdom	1830-2009	2,5	2,2	2,1	1,8
United States	1790-2009	4	3,4	3,3	-1,8
Average		3,7	3	3,4	1,7
Median		3,9	3,1	2,8	1,9
Number of observations = 2,317		866	654	445	352

Source: Reinhart and Rogoff (2010)

Notes: An n.a. denotes no observations were recorded for that particular debt range. There are missing observations, most notably during the World War I and II years; further details are provided in the data appendices to Reinhart and Rogoff (2009) and are available from the authors. Sources: There are many sources, among the more prominent are: International Monetary Fund, World Economic Outlook, OECD, World Bank, Global Development Finance. Extensive other sources are cited in Reinhart and Rogoff (2009).

Table 3: Real GDP growth as the level of government debt varies: selected emerging market economies 1900-2009 (annual percentage change)

		Central (Federal) government debt/ GDP			
Country	Period	Below 30 percent	30 to 60 percent	60 to 90 percent	90 percent and above
Argentina	1900-2009	4,3	2,7	3,6	0,5
Bolivia	1950-2009	0,7	5,2	3,7	3,9
Brazil	1980-2009	3,2	2,3	2,6	2,3
Chile	1900-2009	4	1	7,5	-4,5
Colombia	1923-2009	4,3	3	n.a.	n.a.
Costa Rica	1950-2009	6,9	5	3,4	3
Ecuador	1939-2009	5,3	5	3.2.	1,5
El Salvador	1939-2009	3,6	2,6	n.a.	n.a.
Ghana	1952-2009	n.a.	4,6	4,7	1,9
India	1950-2009	4,2	4,9	n.a.	n.a.
Indonesia	1972-2009	6,6	6,3	-0,1	3,1
Kenya	1963-2009	6,3	4,2	2,3	1,2
Malaysia	1955-2009	2	6,2	6,9	5,5
Mexico	1917-2009	4,1	3,4	1.2.	-0,7
Nigeria	1990-2009	5,4	10,6	11,2	2.6.
Peru	1917-2009	4,3	2,9	2,7	n.a.
Philippines	1950-2009	5	3,8	5,1	n.a.
Singapore	1969-2009	n.a.	9,5	8,2	4.0.
South Africa	1950-2009	2	3,5	n.a.	n.a.
Sri Lanka	1950-2009	3,3	3,7	4,2	5
Thailand	1950-2009	6,1	6,6	n.a.	n.a.
Turkey	1933-2009	5,4	3,7	3,2	-6,4
Uruguay	1935-2009	2,1	3,1	3,2	0
Venezuela	1921-2009	6,5	4,1	3,2	-6,5
Average		4,3	4,1	4,2	1
Median		4,5	4,4	4,5	2,9
Number of observations = 1397		686	450	148	113

Source: Reinhart and Rogoff (2010)

Notes: An n.a. denotes no observations were recorded for that particular debt range. There are missing observations, most notably during the World War I and II years; further details are provided in the data appendices to Reinhart and Rogoff (2009) and are available from the authors. Sources: There are many sources, among the more prominent are: International Monetary Fund, World Economic Outlook, OECD, World Bank, Global Development Finance. Extensive other sources are cited in Reinhart and Rogoff (2009).

Table 4: Inflation as the level of debt varies: summary (annual percentage change)

Measure	Period	Below 30 percent	30 to 60 percent	60 to 90 percent	90 percent and above
			Advanced economies		
Average	1946-2009	6,4	6,3	6,4	5,1
Median	1946-2009	5,2	3,7	3,5	3,9
			Emerging Markets		
Average	1946-2009	64,8	39,4	105,9	119,6
Median	1946-2009	6	7,5	11,7	16,5
			Total (public plus private) Gross External Debt/GDP		
Average	1970-2009	10,3	17	37,1	23,4
Median	1970-2009	10,9	12,1	13,2	16,6

Source: Reinhart and Rogoff (2010)

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