Debt and Growth Revisited

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*Economics has been under fire since the recent crisis for enshrining abstract models that offer little connection to the real world. In "Growth in a Time of Debt," our data-intensive approach aims at providing stylized facts, well beyond selective anecdotal evidence, on the contemporaneous link between debt, growth, and inflation at a time in which the world wealthiest economies are confronting a peacetime surge in public debt not seen since the Great Depression of 1930s, and indeed virtually never in peacetime. As Paul Krugman (2009) observed, "**they'll (the economists) have to do their best to incorporate the realities of finance into macroeconomics.**" One might add as a corollary, however, that such discipline is especially needed when those realities are inconvenient to strongly-held opinions.*

In a recent paper, we studied economic growth and inflation at different levels of government and external debt.[1] The public discussion of our empirical strategy and results has been somewhat muddled. Here, we attempt to clarify matters, particularly with respect sample coverage (our evidence encompasses forty-four countries over two centuries--not just the United States), debt-growth causality (our book emphasizes the bi-directional nature of the relationship), as well as nonlinearities in the debt-growth connection and thresholds evident in the data (absolutely central points that seem to have been lost in some commentary.)

In addition to clarifying the earlier results, this paper enriches our original analysis by providing further discussion of the high debt (over 90 percent of GDP) episodes and their incidence. Some of the implications of our analysis, including for the United States, are taken up in the final section.

[1] Carmen M. Reinhart and Kenneth S. Rogoff, "Growth in a Time of Debt," (2010a). *American Economic Review,* Vol. 100 No. 2, May, 573-78.

We begin by re-iterating some of the main results of Reinhart and Rogoff (2010a). The careful reader of our earlier paper can skip to section 2.

1. The basic exercise and key results

Our analysis was based on newly-compiled data on forty-four countries spanning about two hundred years. This amounts to 3,700 annual observations and covers a wide range of political systems, institutions, exchange rate arrangements, and historic circumstances.

The main findings of that study are:

First, the relationship between government debt and real GDP growth is weak for debt/GDP ratios below 90 percent of GDP.[2] Above the threshold of 90 percent, median growth rates fall by one percent, and average growth falls considerably more. The threshold for public debt is similar in advanced and emerging economies and apply for both the post World War II period and as far back as the data permit (often well into the 1800s).

Second**,** emerging markets face lower thresholds for total external debt (public and private)—which is usually denominated in a foreign currency. When total external debt reaches 60 percent of GDP, annual growth declines about two percent; for higher levels, growth rates are roughly cut in half.

Third, there is no apparent contemporaneous link between inflation and public debt levels for the advanced countries as a group (some countries, such as the United

[2] In this paper "public debt" refers to gross central government debt. "Domestic public debt" is government debt issued under domestic legal jurisdiction. Public debt does not include obligations carrying a government guarantee. Total gross external debt includes the external debts of **all** branches of government as well as private debt that issued by domestic private entities under a foreign jurisdiction.

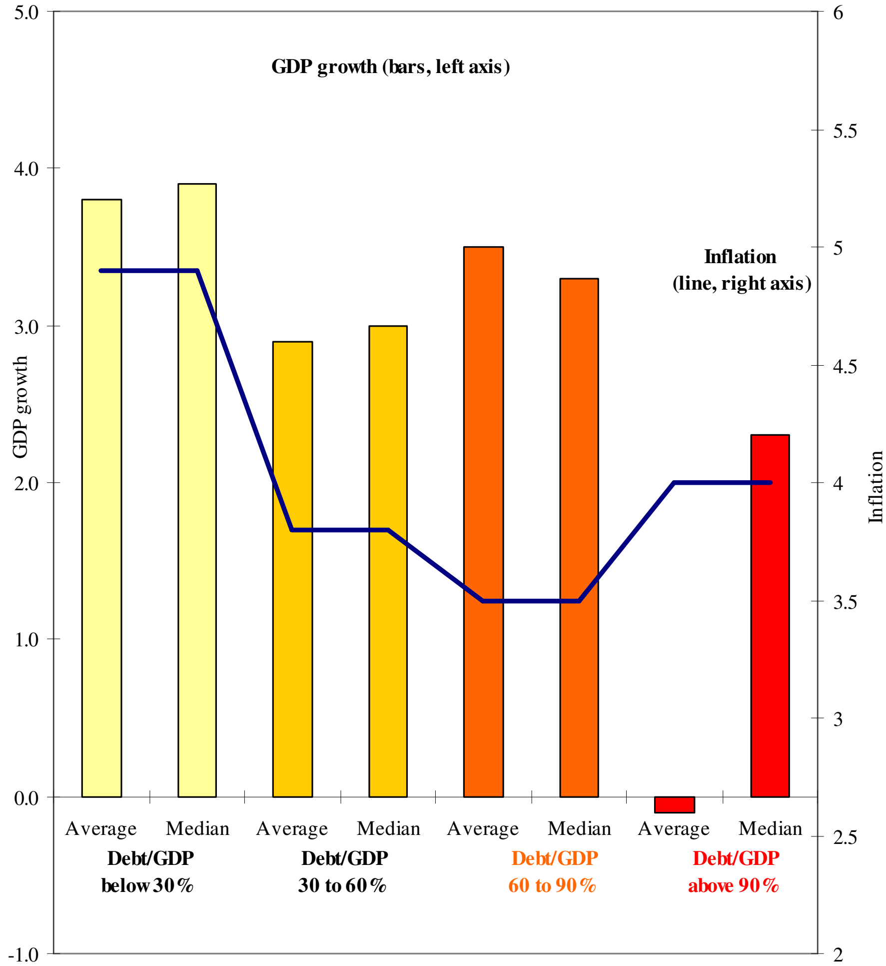
States, have experienced higher inflation when debt/GDP is high.) The story is entirely different for emerging markets, where inflation rises sharply as debt increases.

Figure 1, from RR (2010a), can be used to summarize our main conclusions as they apply to the twenty advanced countries in our forty-four country sample. We will concentrate here on the advanced countries as where much of the public debate is centered.[3]

In the figure, the annual observations are grouped into four categories, according to the ratio of debt-to GDP during that particular year: years when debt-to-GDP levels were below 30 percent; 30 to 60 percent; 60 to 90 percent; and above 90 percent. [4] The bars show average and median GDP growth for each of the four debt categories. Note that of the 1,186 annual observations, there are a significant number in each category, including 96 above 90 percent. (Recent observations in that top bracket come from Belgium, Greece, Italy, and Japan.) From the figure, it is evident that there is **no** obvious link between debt and growth until public debt exceeds the **90 percent** threshold. The observations with debt to GDP over 90 percent have median growth roughly 1 percent lower than the lower debt burden groups and mean levels of growth almost 4 percent lower. (Using lagged debt does not dramatically change the picture.) The line in Figure 1 plots the median inflation for the different debt groupings—which makes plain that there is **no** apparent pattern of **simultaneous** rising inflation and debt.

[3] The comparable emerging market exercises are presented in the original paper.
[4] The four "buckets" encompassing low, medium-low, medium-high, and high debt levels are based on our interpretation of much of the literature and policy discussion on what are considered low, high etc. debt levels. It parallels the World Bank country groupings according to four income groups. Sensitivity analysis involving a different set of debt cutoffs merits exploration, as do country-specific debt thresholds along the broad lines discussed in Reinhart, Rogoff, and Savastano (2003).

Figure 1. Government Debt, Growth, and Inflation: Selected Advanced Economies, 1946-2009



Notes: Central government debt includes domestic and external public debts. The 20 advanced economies included are Australia. Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, the United Kingdom, and the United States. The number of observations for the four debt groups are: 443 for debt/GDP below 30%; 442 for debt/GDP 30 to 60%; 199 observations for debt/GDP 60 to 90%; and 96 for debt/GDP above 90%. There are 1,180 observations.
Sources: Reinhart and Rogoff (2010a) and sources cited therein.

2. High debt episodes in the sample

The episodes that attract our interest are those where debt levels were historically high. As convenient as it is to focus exclusively on a particular country or a single episode for a single country (like the U.S. around World War II, where the data is readily available or an interesting ongoing case, like Japan), the basis for an empirical regularity is multiple observations.   Because our data span 44 countries with many going back to the 1800s or (at least the beginning of the 19th century), our analysis is based on all the episodes of high (above 90 percent) debt for the post World War II period; for the pre-war sample it covers all those that are encompassed by the availability of data. Table 1 is reproduced from RR (2010a) and describes the coverage and the basic statistics for the various debt levels for the advanced economies.[5]

It is common knowledge that the United States emerged after World War II with a very high debt level. But this also held for Australia, Canada, and most markedly the United Kingdom, where public/debt GDP peaked at near 240 percent in 1948. These cases from the aftermath of World War II are joined in our sample by a number of peacetime high-debt episodes: the 1920s and 1980s to the present in Belgium, the 1920s in France, Greece in the 1920s, 1930s and 1990s to the present, Ireland in the 1980s, Italy in the 1990s, Spain at the turn of the last century, the U.K. in the interwar period and prior to the 1860s and, of course, Japan in the past decade.   As will be discussed, episodes where debt is above 90 percent are themselves rare and as shown in Table 1, a number of countries have never had debt entries above 90 percent.

[5] The interested reader is referred to the original paper for the comparable emerging market table.

Table 1. Real GDP Growth as the Level of Government Debt Varies:
Selected Advanced Economies, 1790-2009
(annual percent change)

Country	Period	Central (Federal) government debt/ GDP			
		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	3.0	2.3	n.a.
Belgium	1835-2009	3.0	2.6	2.1	3.3
Canada	1925-2009	2.0	4.5	3.0	2.2
Denmark	1880-2009	3.1	1.7	2.4	n.a.
Finland	1913-2009	3.2	3.0	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	***0.3***	***4.8***	2.5
Ireland	1949-2009	4.4	4.5	4.0	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	4.0	2.8	2.4	2.0
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	4.0	3.4	3.3	***-1.8***
Average		**3.7**	**3.0**	**3.4**	**1.7**
Median		**3.9**	**3.1**	**2.8**	**1.9**
Number of observations = **2,317**		866	654	445	352

Notes: An n.a. denotes no observations were recorded for that particular debt range. There are missing observations, most notably during 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. Minimum and maximum values for each debt range are shown in ***bolded italics.***
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 Reinhart and Rogoff (2009).

3. Debt thresholds and nonlinearities: the 90 percent benchmark

Thresholds and non-linearities play a key role in understanding the relationship between debt and growth that should not be ignored in casual re-interpretations.

(i) Thresholds. Anyone who has done any work with data is well aware that mapping a vague concept, such as “high debt” or or “over-valued” exchange rates to a workable definition for interpreting the existing facts and informing the discussion requires making arbitrary judgments about where to draw lines. In the case of debt, we worked with four buckets 0-30, 30-60, 60-90, and over 90 percent. The last one turned out to be the critical one for detecting a difference in growth performance, so we single it out for discussion here.

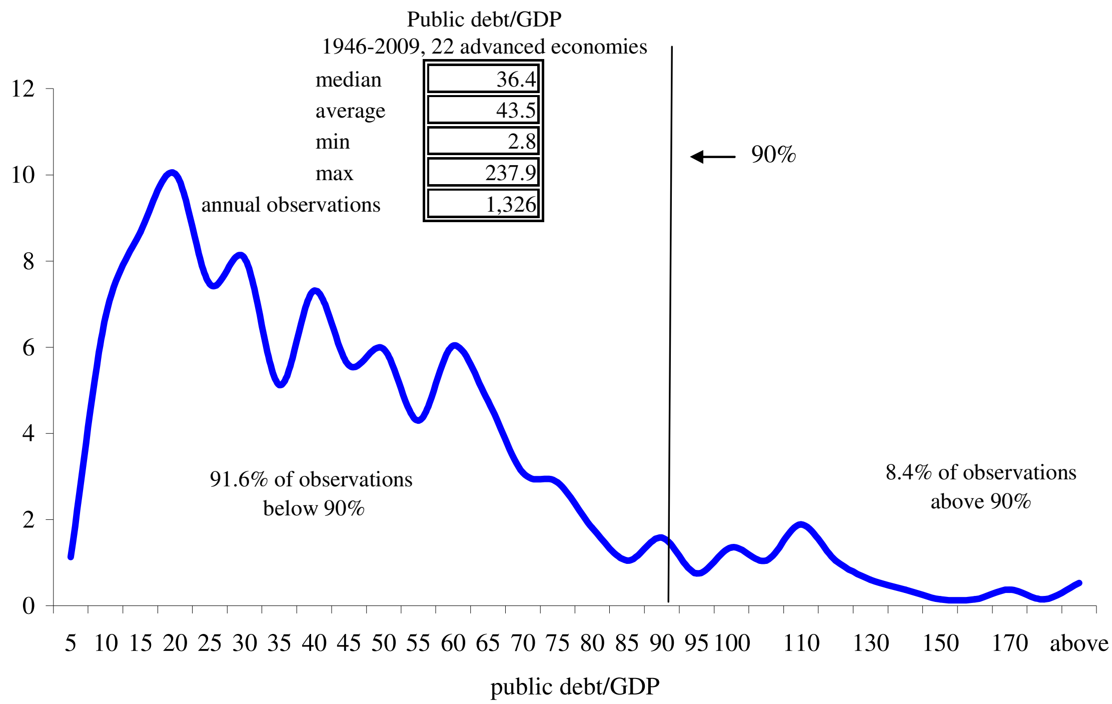
Figure 2 shows a histogram of public debt-to-GDP as well as pooled descriptive statistics (inset) for the advanced economies (to compliment the country-specific ones shown in Table 1) over the post World War II period.[6] The median public debt/GDP ratio is 36.4; about **92 percent** of the observations fall **below** the 90 percent threshold. In effect, about 76 percent of the observations were below the 60 percent Maastricht criteria. Put differently, our "high vulnerability" region for lower growth (the area under the curve to the right of the 90 percent line) comprises only about 8 percent of the sample population. The standard considerations about type I and type II errors apply here.[7] If we raise the upper bucket cutoff much above 90 percent, then we are relegating the high-debt analysis to case studies (the UK in 1946-1950 and Japan in recent years). Only about ***two percent*** of the observations are at debt-GDP levels at or above **120** percent—and that includes the aforementioned cases.

If debt levels above 90 percent are indeed as benign as some suggest, one might have expected to see a higher incidence of these over the long course of history. Certainly our read of the evidence, as underscored by the central theme of our 2009 book,

[6] Our sample includes 24 emerging market countries.
[7] The null hypothesis is whatever "normal" growth is versus the alternative of lower growth.

Figure 2. The 90 percent debt/GDP threshold: 1946-2009, Advanced economies

Probability density function



Sources: Reinhart and Rogoff (2009 and 2010a).
Notes: The advanced economy sample is the complete IMF grouping (Switzerland and Iceland were added). It includes Australia. Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland ,the United Kingdom, and the United States.

hardly suggests that politicians are universally too cautious in accumulating high debt levels. Quite the contrary, far too often they take undue risks with debt buildups, relying implicitly perhaps on the fact these risks often take a very long time to materialize. If debt to GDP levels over 90 percent are so benign, then generations of politicians must have been overlooking proverbial money on the street.

We do not pretend to argue that growth will be normal at 89 percent and subpar (about one percent lower) at 91 percent debt/GDP any more than a car crash is unlikely at 54mph and near certain at 56mph. However, mapping the theoretical notion of "***vulnerability regions***" to bad outcomes by necessity involves defining thresholds, just as traffic signs in the U.S. specify 55mph. [8]

(ii) Nonlinear relationship. We summarized the results in our paper by writing: ***"the relationship between government debt and real GDP growth is weak for debt/GDP ratios below a threshold of 90 percent of GDP. Above 90 percent, median growth rates fall by one percent, and average growth falls considerably more."*** RR (2010a) Revisiting Figure 1 is useful for illustrating the importance of nonlinearities in the debt-growth link. Simply put, for 92 percent of the observations in our sample there is no systematic link between debt and growth.[9] Thus, if one were to do a simple scatterplot of all the observations on debt/GDP and on growth one would expect to find a "clouded mess." We can highlight this general point with the U.S. case. As noted in the working paper version of RR (2010a), for the period 1790-2009, there are a total of 216 observations of which 211 (or 98 percent) are below the 90 percent debt to GDP cutoff.[10] **It should be quite obvious, that a scatter plot of the U.S. data would not be capable of revealing a systematic pattern** (as demonstrated in the work Iron and Bivens, 2010.) Indeed, this example illustrates one of our main results, that there is no systematic relationship between debt and growth below a threshold of 90 percent of GDP.

4. Debt and growth causality

As discussed, we examine average and median growth and inflation rates **contemporaneously** with debt. Temporal causality tests are not part of the analysis. The application of many of the standard methods for establishing temporal precedence is

[8] These methodology issues are discussed in Kaminsky and Reinhart (1999).

[9] Bruno and Easterly (1998) find similar nonlinearities in the inflation-growth relationship.

[10] Figure 3 in the NBER WP is not included in the published version of the paper.

complicated by the nonlinear relationship between growth and debt (more of this to follow) that we have alluded to.

But where do we place the evidence on causality? For low-to-moderate levels of debt there may or may not be one; the issue is an empirical one, which merits study. For high levels of debt the evidence points to ***bi-directional*** causality.

Growth- to debt: Our analysis of the aftermath of financial crisis RR (2008) presents compelling **evidence** for both advanced and emerging markets over 1800-2008 on the fiscal impacts (revenue, deficits, debts, and sovereign credit ratings) of the recessions associated with banking crises; see Figure 3.

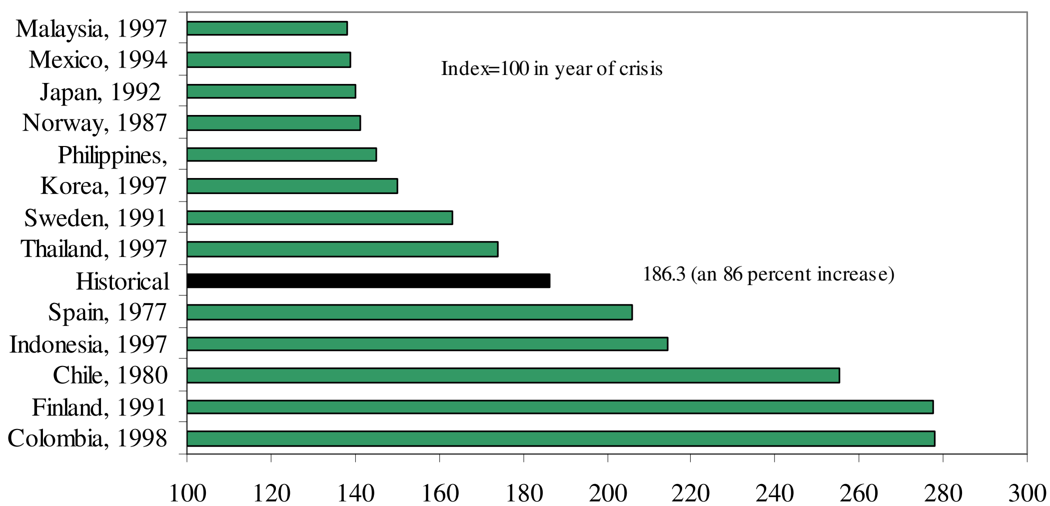
As we sum up,

"Banking crises weaken fiscal positions, with government revenues invariably contracting. Three years after a crisis central government debt increases by about 86 percent. The fiscal burden of banking crisis extends beyond the cost of the bailouts." Reinhart and Rogoff (2008).[11]

There is little room to doubt that severe economic downturns, irrespective whether their origins was a financial crisis or not, will, in most instances, lead to higher debt/GDP levels contemporaneously and or with a lag. There is, of course, a vast literature on cyclically-adjusted fiscal deficits making exactly this point.

[11] See Section IV devoted to fiscal consequences in Carmen M. Reinhart and Kenneth S. Rogoff (2008), "Banking Crises: An Equal Opportunity Menace," NBER Working Paper No. 14587, December see also Laeven and Valencia (2010).

Figure 3. Cumulative Increase in Public debt in the Three Years Following the Banking Crisis



Source: Reinhart and Rogoff (2008).

Debt-to-growth: A unilateral causal pattern from growth to debt, however, does **not** accord with the evidence. Public debt surges are associated with a higher incidence of debt crises.[12] This temporal pattern is analyzed in RR (2010b) and in the accompanying country-by-country analyses cited therein.[13] In the current context, even a cursory reading of the recent turmoil in Greece and other European countries can be importantly traced to the adverse impacts of high levels of government debt (or potentially guaranteed debt) on county risk and economic outcomes. At a very basic level, a high public debt burden implies higher future taxes (inflation is also a tax) or lower future government spending, if the government is expected to repay its debts.

There is scant evidence to suggest that high debt has little impact on growth. Kumar and Woo (2010) highlight in their cross-country findings that debt levels have

[12] For a model where credit-financed government deficits lead to a currency crisis, see Krugman (1979).
[13] RR (2010b).

negative consequences for subsequent growth, even after controlling for other standard determinants in growth equations. For emerging markets, an older literature on the debt overhang of the 1980s frequently addresses this theme.

5. Implications and U.S. policy

One need look no further than the stubbornly high unemployment rates in the United States and other advanced economies to be convinced how important it is to develop a better understanding of the growth prospects for the decade ahead. We have presented evidence, (in a multi-country sample spanning about two centuries), suggesting that high levels of debt dampen growth. One can argue that the United States can tolerate higher levels of debt than other countries without having its solvency called into question. That is probably so.[14] We have shown in our earlier work that a country's credit history plays a prominent role in determining what levels of debt it can sustain without landing on a sovereign debt crisis. More to the point of this paper, however, we have no comparable evidence yet to suggest that the consequences of higher debt levels for ***growth*** will be different for the U.S than for other advanced economies. It is an issue yet to be explored.

Figure 4, which plots total (public and private) credit market debt outstanding for the United States during 1916 to 2010:Q1 makes this point plain.[15] Despite considerable deleveraging by the private financial sector, total debt remains near its historic high in 2008. Total public sector debt during the first quarter of 2010 is 117 percent of GDP; since 1916 (when this series begins). It has only been higher during a one-year stint at

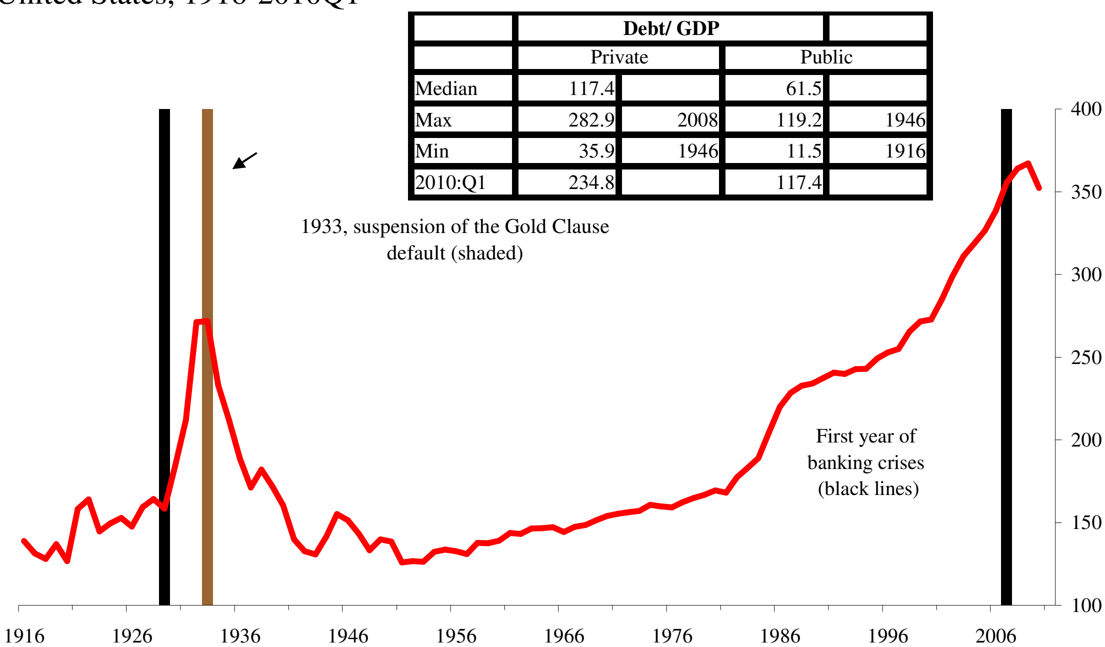
[14] Indeed, this is the central argument in Reinhart and Reinhart (2010) originally published in November 17, 2008.

[15] Flow of Funds aggregate the private and public sectors, where the latter is comprised of federal (net), state and local and government enterprises. To reiterate, this is not the public debt measure used in our historical analysis, which is gross central government debt (which for the U.S. is at present about 90 percent of GDP).

119 percent in 1945. Perhaps soaring U.S. debt levels will not prove to be a drag on growth in the decades to come. However, if history is any guide, that is a risky proposition and over-reliance on U.S. exceptionalism may only prove to be one more example of the “This Time is Different” syndrome.[16]

For many if not most advanced countries, dismissing debt concerns at this time is tantamount to ignoring the proverbial elephant in the room.

Figure 4. Total (Public and Private) Credit Market Debt Outstanding:
United States, 1916-2010Q1



	Debt/ GDP			
	Private		Public	
Median	117.4		61.5	
Max	282.9	2008	119.2	1946
Min	35.9	1946	11.5	1916
2010:Q1	234.8		117.4	

Sources: Historical Statistics of the United States, Flow of Funds, Board of Governors of the Federal Reserve International Monetary Fund, *World Economic Outlook.*
Notes: Beginning in 2010:Q1, almost all Fannie Mae and Freddie Mac mortgage pools are consolidated in Fannie Mae’s and Freddie Mac’s balance sheets and, thus, are included in the debt of government enterprises.

[16] The “This Time is Different Syndrome” is rooted in the firmly-held beliefs that: (i) Financial crises and negative outcomes are something that happen to other people in other countries at other times (these do not happen here and now to us);(ii) we are doing things better, we are smarter, we have learned from the past mistakes; (iii) as a consequence, old rules of valuation are not thought to apply any longer.

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