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Shipman, Arthur F.

The New Arthurian Economics

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Measuring the Erosion of Debt

Arthur Shipman

The New Arthurian Economics

<http://newarthurianeconomics.blogspot.com/>

15 August 2012

ABSTRACT

The calculation used for the inflation-adjustment of debt often produces incorrect results. With Debt and GDP adjusted by the same calculation and for the same inflation, the Debt/GDP ratio after adjustment must be equal to the ratio before adjustment. A graph comparing the ratio of nominals to the ratio of reals would show them to be identical. Such a graph will show no erosion of debt. But this is absurd. Instead, let each year's addition to debt be adjusted for inflation separately. Then the ratio of reals will run higher than the ratio of nominals, and will react to changes in inflation. It is a simple matter, then, to measure the erosion of debt.

Introduction

The typical inflation-adjustment of GDP takes the total dollar value of one year's output and converts it to the dollar value for another year. To do this is fairly simple: divide the one year's price number out of the GDP, and multiply the other year's price into it.

For example, if a basket of goods used to cost \$80 but now costs \$125, take GDP now, divide by the current price, and multiply by the old price. That's it.

This calculation is used all the time to figure what economists call "real GDP". But something goes wrong when we figure "real debt" that way.

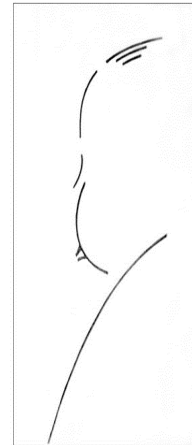
Consider one particular year. The new debt created that year should be adjusted the same way GDP is adjusted for that year: Divide by that year's price level, and multiply by some base-year price. But this is precisely where the commonly used calculation goes wrong.

The problem is that the total debt number for any one year does not include only new debt created that year. It also includes a lot of old debt left over from previous years. But the current year's price number is relevant only for the current year's additions to debt. For older debt included in the current balance, you have to use price numbers from prior years.

A useful technique is to separate the new debt from the old. Then, inflation-adjust the new debt for the year just the same way you would inflation-adjust the GDP for that year. Next, look at the old debt that you didn't adjust yet, pull out the most recent year's debt remaining in it, and inflation-adjust that year's debt using that year's price number.

And then keep doing that, stepping back a year and adjusting just the one year's debt the same way you would figure real GDP for that year, then stepping back another year. You go back as far as you can go, adjusting each year's debt separately, and add them up at the end.

This method may be called the "incremental adjustment" of debt.



Context and Relevance

I don't mean to harp on it. But a lot of people seem to think you can adjust debt for inflation the same way you adjust GDP for inflation¹. You cannot. It works for GDP, because GDP is a measure of *one* year's output. It doesn't work for debt, because any one year's debt is almost certainly an accumulation of *many* years' deficits.

Paul Krugman recently used this graph in a "Conscience of a Liberal" blog post:

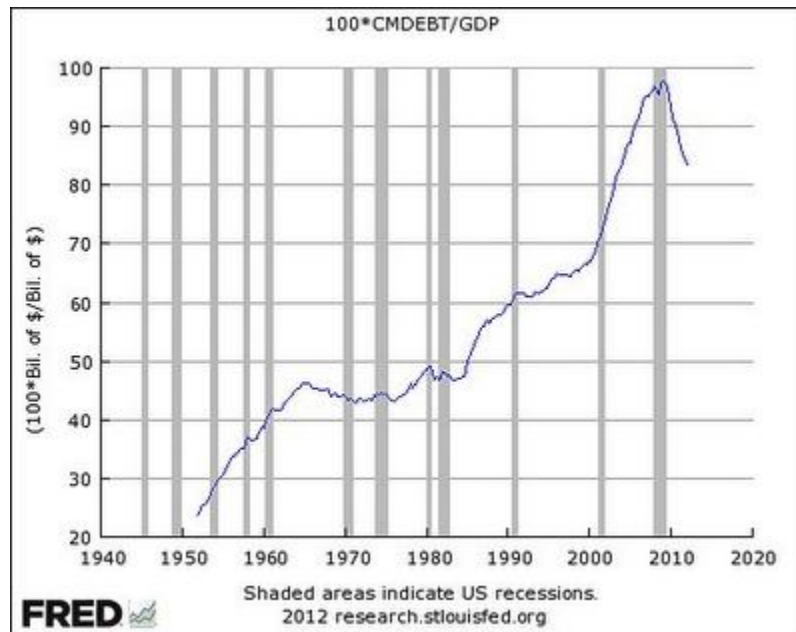


Figure 1: Krugman's Graph

Krugman² and Scott Sumner³ and Marcus Nunes⁴ and Joshua Wojnilower⁵ all discussed this graph.

Krugman sees "a dramatic rise in household debt, which many of us now believe lies at the heart of our continuing depression."

Sumner says "I suppose it's in the eye of the beholder, but I see three big debt surges: 1952-64, 1984-91, and 2000-08."

¹ One example: Figure 1 of <http://www.frbsf.org/publications/economics/letter/2009/el2009-16.html>

² <http://krugman.blogs.nytimes.com/2012/07/18/thirty-troubling-years/>

³ <http://www.themoneyillusion.com/?p=15389>

⁴ <http://thefaintofheart.wordpress.com/2012/07/18/to-really-understand-the-depression-we-have-to-stop-pulling-red-herrings-from-the-hat/>

⁵ <http://bubblesandbusts.blogspot.com/2012/07/debt-surges-dont-cause.html>

Nunes writes, "Why does the share of debt rise? I believe it reflects peoples 'optimism' about future prospects... During the 1950s and first half of the 1960s we observe a rise in household debt. People felt good about the future... Note, however, that as soon as inflation begins to trend up in the second half of the 60s, the future doesn't look so bright anymore. Households don't increase indebtedness..."

And, when Sumner reports that the first two debt surges were followed by golden ages and the third by a severe recession, and then asks "What was different with the third case?", Joshua Wojnilower responds:

"The difference is the aggregate amount of household debt compared with incomes... As the aggregate amount of debt rises ...an increasing percentage of income and savings becomes necessary to cover interest costs and... pay back previous debt. These actions reduce the amount of income and savings available for consumption and investment, creating a drag on economic growth."

Wojnilower doesn't read anything into the graph. He doesn't chop it up into surges and remissions the way Sumner does. He doesn't attribute the surges to optimism, the way Nunes does. He doesn't even describe the increase as "dramatic" the way Krugman does. Wojnilower says only that debt grew to a very high level, then lays out a scenario to identify some troubles that may arise from excessive debt.

By contrast, Sumner presents a relaxed, eye-of-the-beholder evaluation of the graph. He points out "three big debt surges" and the remission of debt growth following each. And yes, if you glance at the graph, you can see those surges.

But Sumner's evaluation of the graph is too relaxed, and he misses an important detail. He puts the end of the first surge at 1964, and the start of the second at 1984. As luck would have it, Allan Meltzer⁶ puts the start of the Great Inflation at 1965, and its end at 1984. The Great Inflation fits snugly between the first two of Sumner's surges.

Could Sumner have failed to notice? With all the ruckus these days, all the call for policymakers to raise the inflation target from 2% to 4% or more to inflate debt away, I don't see how he could possibly have overlooked the Great Inflation.

The Great Inflation significantly reduced the burden of debt relative to GDP. That is the reason the graph appears to show remission between Sumner's first and second surges.

⁶ <http://research.stlouisfed.org/publications/review/05/03/part2/Meltzer.pdf>

Sumner might be thinking that the inflation in the numerator and denominator of Krugman's ratio cancel each other out. If that was the case, however, there could be no such thing as the erosion of debt by inflation.

Ada and Ida

To establish a frame of reference, I wanted to be sure I could duplicate Krugman's graph. This step is almost unnecessary, as the St. Louis Fed's FRED graphs are so well documented.

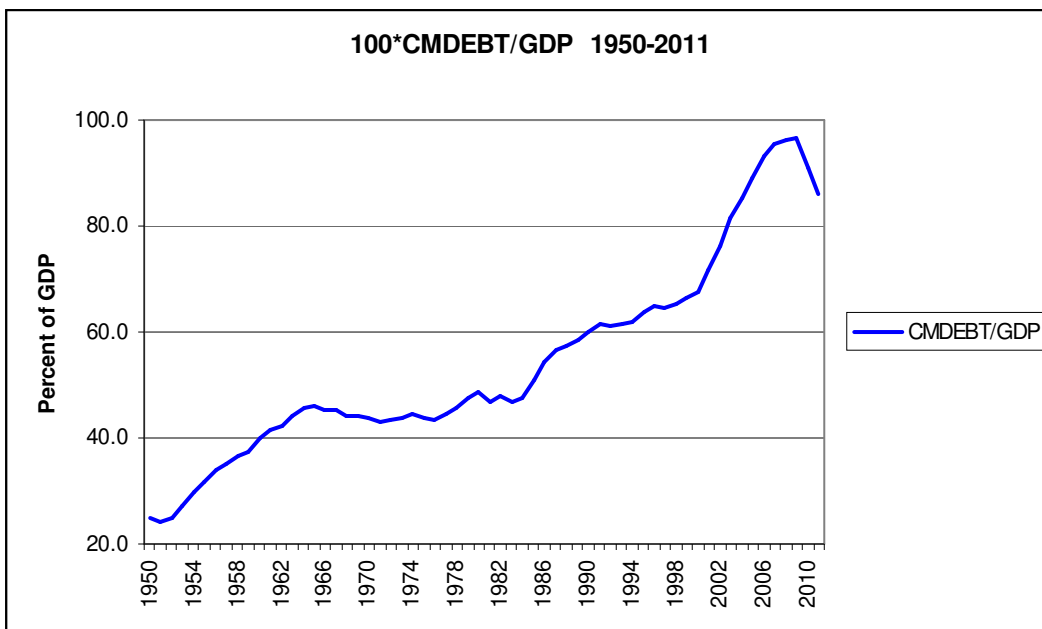


Figure 2: My version of Krugman's Graph

Not bad. If you see differences, it is because I downloaded annual data from FRED, and Krugman probably used the default quarterly data. Both graphs show the same "face" in profile -- a nose in the 1980s, a chin before that, a neck in the early 1960s. Even a suggestion of eyes and hair can be seen in the graph.

CMDEBT, by the way, is short for "Household Credit Market Debt Outstanding" from FRED, the Federal Reserve Economic Data service of the St. Louis Fed.

Next, a look at the raw debt numbers, along with "real debt" numbers figured by aggregate adjustment, the same way "real GDP" is figured:

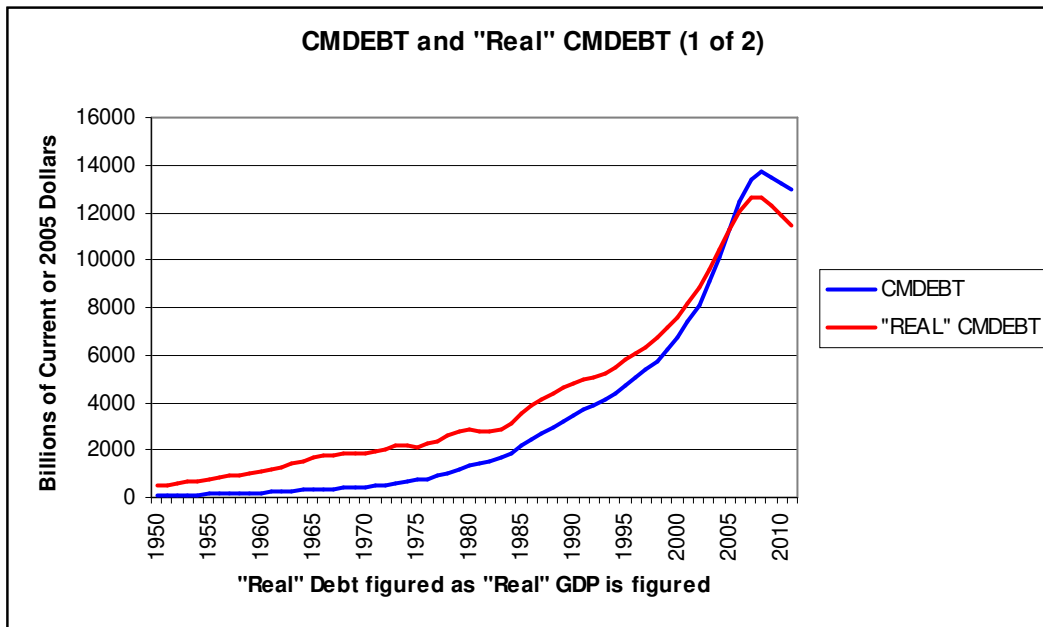


Figure 3: Nominal and Aggregate-Adjusted Real

The relation between the two lines shown on Figure #3 is similar to the relation between Nominal GDP and Real GDP, which you have probably seen many times. The two lines cross in 2005, because the price deflator used for the conversion has 2005 as its base year. The red line is higher than the blue in the years before 2005, and the blue line is higher in the years after 2005, because of inflation.

Suppose you wanted to use this graph to learn something about inflation's ability to "erode" debt. In 2005 the lines cross. The real and nominal values are equal in 2005. In other words, as of 2005 there had been no erosion of debt, despite all the inflation between 1950 and 2005.

That is wrong, of course. But it is what the graph shows.

The calculation used to figure "real" debt is incorrect. Aggregate adjustment is valid for flows like GDP, but not for stocks like debt.

Next, the same graph again, but this time using incremental inflation adjustment to adjust each year's debt separately, as is appropriate for a stock like debt:

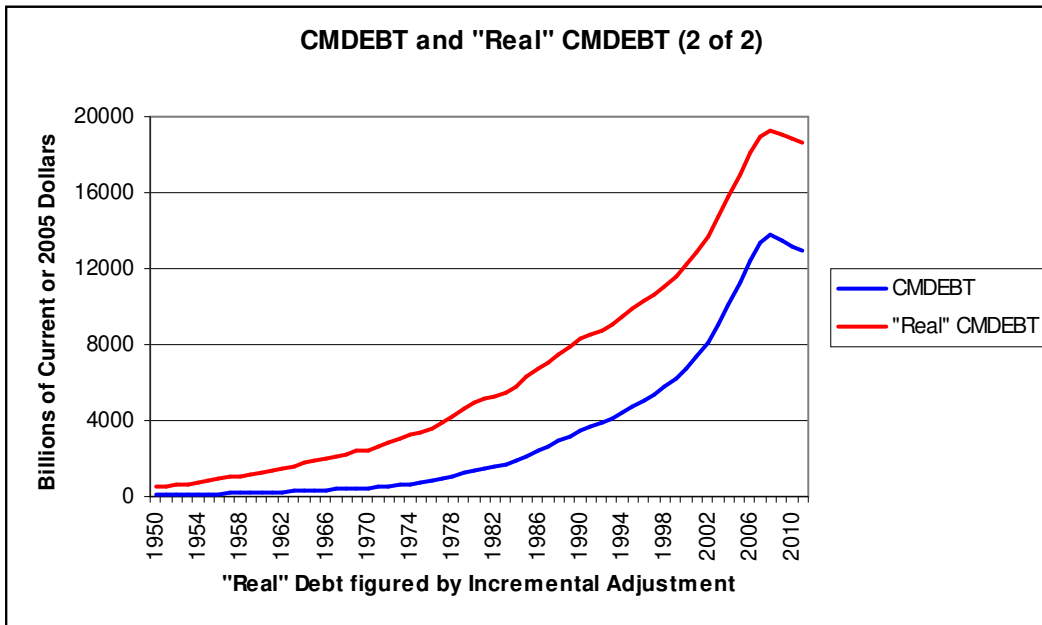


Figure 4: Nominal and Incrementally Adjusted Real

Here, real debt is significantly higher than nominal debt at every point on the graph. The red line is higher than the blue by the amount that debt was eroded by inflation. If you want to see the effect that inflation has on debt, this graph shows it. Incremental Data Adjustment (IDA) shows it.⁷

The Simple Things

Now we can look again at CMDEBT relative to GDP, the relation we started with. But I want to look at this relation three different ways.

I want to see nominal CMDEBT divided by nominal GDP. This is the same version that Krugman showed in his graph.

⁷ Figures 2 through 4 and the relevant numbers are available in the Google Docs spreadsheet at this awkward URL:
<https://docs.google.com/spreadsheet/ccc?key=0Aupyd4Usl6QkdHZ6S0N3WWU5TXNMchFma0NrQ1JsbGc>

I want to see real CMDEBT divided by real GDP, where real CMDEBT is figured by ADA (Aggregate Data Adjustment), just as real GDP is figured.

And I want to see real CMDEBT divided by real GDP, where real CMDEBT is figured by IDA or Incremental Data Adjustment.

The first two can be done in FRED:

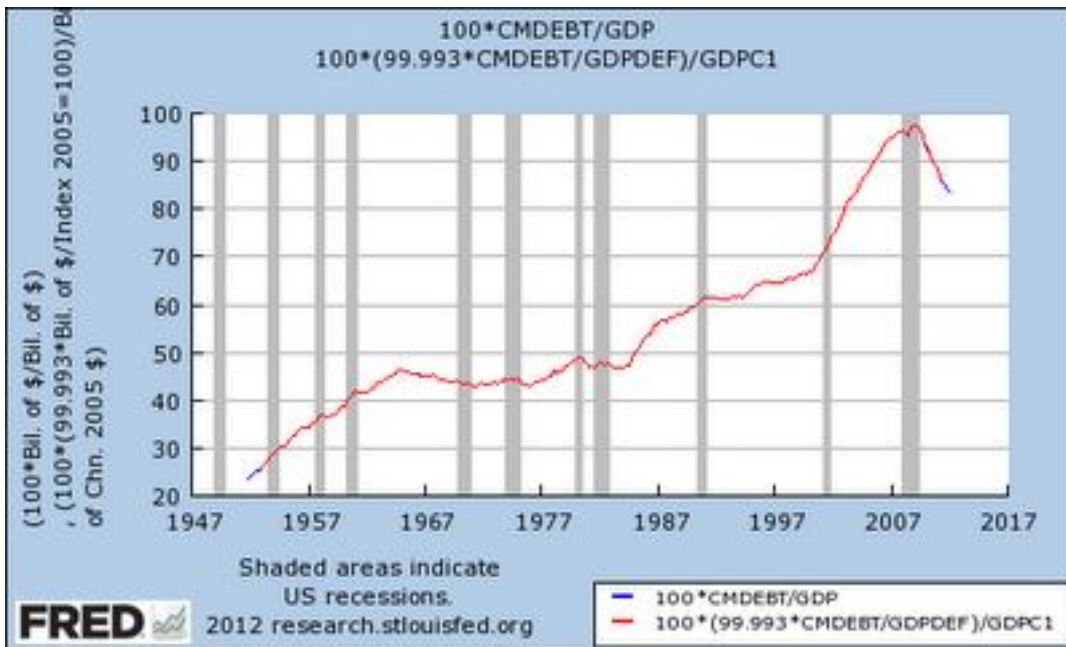


Figure 5: Two Lines in the Same Location

The blue line shows nominal debt divided by nominal GDP. The red line shows real debt divided by real GDP.

The blue line in Figure 5 is almost entirely hidden by the red line. I started the red line just a bit late, and stopped it just a bit early, so you can see there actually is a blue line on the graph.

The two lines are identical.

The blue line shows CMDEBT relative to GDP using "nominal" values, exactly as Krugman has it on his graph. I even multiplied by 100, as Krugman did, to convert the ratio values to percent values. (The "99.993" in the second formula is the price number for 2005, the base year for FRED's GDPDEF series.)

The red line shows CMDEBT relative to GDP using "real" values. Debt is adjusted on this graph by ADA, the same inflation-adjustment calculation that is used all the time for figuring real GDP. In other words, GDP and CMDEBT are adjusted the

same way and for the same amount of inflation. As a result, the Debt/GDP ratio after adjustment is equal to the ratio before adjustment, and the red line ends up in exactly the same location as the blue line.

Figure 5 shows absolutely no "erosion" of debt resulting from inflation. But this is absurd. The inflation adjustment of debt on this graph is certainly wrong.

The above graph shows only that *anything divided by itself equals one*.

REAL/REAL = 1 = NOMINAL/NOMINAL

Perhaps this is the relation Scott Sumner had in mind when he ignored the effect of inflation on debt for the 1964-1984 period.

Sumner's "three surges" analysis of Krugman's graph, though seemingly accurate on its face, is deeply flawed. The analysis ignores the effect of inflation on debt. It pretends there is no such thing as erosion of debt. It misinterprets the effect of inflation, reading it as a significant reduction in new borrowing.

Marcus Nunes then builds upon Sumner's error, creating a plausible story about optimism to explain the reduction in new borrowing during the Great Inflation. But this reduction in new borrowing is something that *did not actually happen*.

If the simple things are not laid out correctly, then everything built upon the simple things is at risk of being wrong. As Keynes put it: "...the error is to be found not in the superstructure, which has been erected with great care for logical consistency, but in a lack of clearness and of generality in the premisses."

Erosion and De-rosion

Table 1

Table 1 presents compound annual growth rate figures for the three debt surges identified by Scott Sumner, and the two intervening remissions.

Compound Annual Growth Rate by Period				
Years	CMDEBT	NGDP	CPI	RGDP
1952-1964	10.7	5.3	1.3	3.5
1964-1984	9.5	9.3	6.2	3.4
1984-1991	10.3	6.2	3.9	2.9
1991-2000	6.9	5.8	2.6	3.8
2000-2008	9.3	4.6	2.8	2.0

Growth rates for CMDEBT in the surge periods beginning 1952, 1984, and 2000 are certainly high. But note that the growth rate of the apparent remission beginning in 1964 is also very high. It is higher, in fact, than Sumner's third surge.

But during that third surge, the growth rate of nominal GDP was only about half the rate of debt growth. During the first remission, by contrast, the growth of nominal

GDP (at 9.3%) very nearly equaled the growth of debt. The ratio of debt to GDP appears very different in the two cases. For the period beginning in 1964, the ratio shows almost no increase at all. This creates the false appearance of a significant reduction of debt growth. In truth, the significant change was in Nominal GDP.

As Sumner himself said in a different context, "A few of us market monetarists argued that you also needed to look at the denominator of the debt/income ratio, not just the numerator."⁸

Let us look now at real debt relative to real GDP, where each year's addition to debt is inflation-adjusted separately based on that year's price level, a calculation called Incremental Data Adjustment:

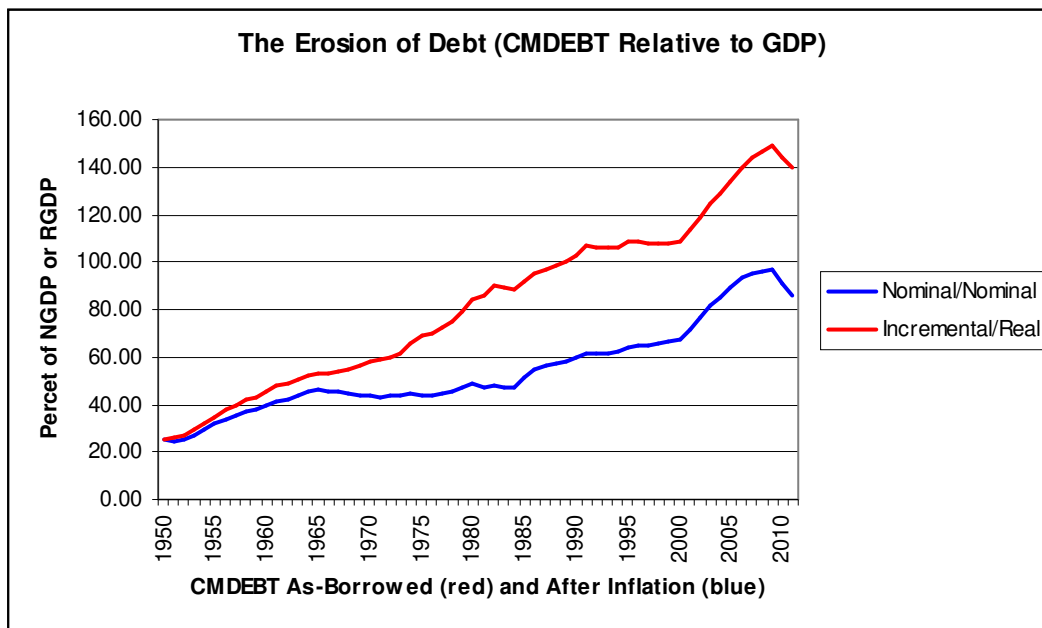


Figure 6: CMDEBT Relative to GDP, Nominal and Real

The blue line is the same that Krugman presented, as seen in Figures 1 and 2. You can still see a hint of the face in profile -- the nose, the chin, the forehead. This is CMDEBT relative to GDP, expressed as a percent, straight out of St. Louis. Nominal divided by nominal.

The red line is real CMDEBT divided by real GDP. It uses incremental adjustment of debt, and aggregate adjustment of GDP. The red line runs higher than the blue because inflation erodes debt and this graph shows it. Just a glance at Figure 6 is sufficient to verify that the great flat spot of the Great Inflation, so clearly visible in the blue line, is altogether absent from the red line.

⁸ <http://www.themoneyillusion.com/?p=13140>

Picture a straight-line trend drawn for the red, real debt data. It would show debt growth only slightly above trend during Sumner's 1952-1964 and 1984-1991 surge periods, and slightly below trend during the 1964-1984 remission.

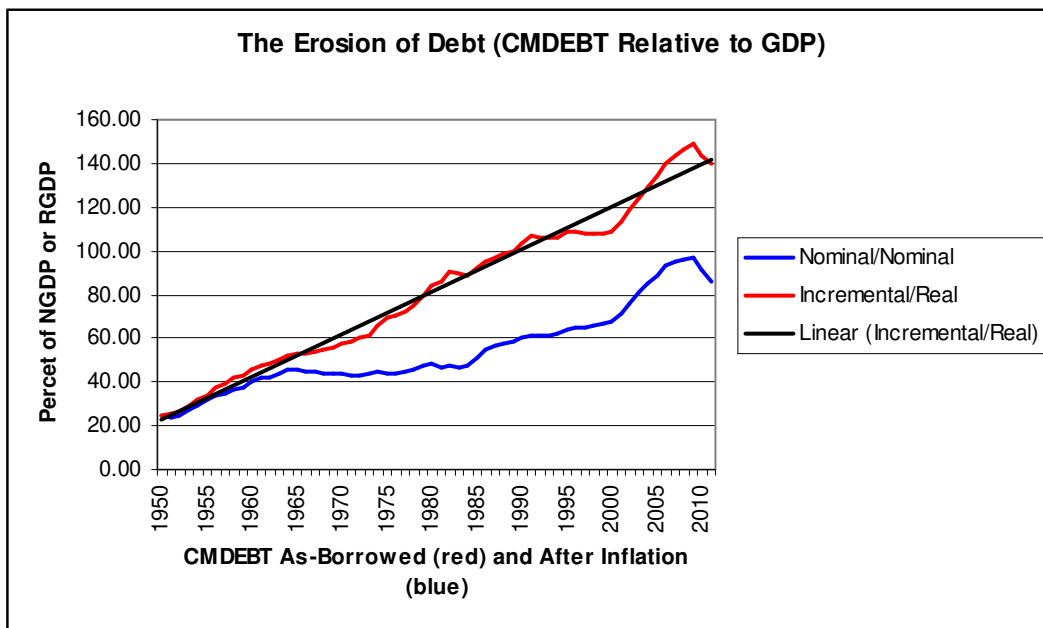


Figure 7: Linear Trend and the Absence of Remission

The flat spot so clearly visible on the blue line from the mid-1960s to the mid-1980s is absent from the red.

The red line -- *incremental* real debt relative to *aggregate* real GDP – also shows a striking similarity to the "compound annual growth rate" numbers in Table 1.⁹ Given a debt growth trend of about 10% per year, the table shows CMDEBT growth slightly above trend during Sumner's 1952-1964 and 1984-1991 surge periods, and slightly below trend during the 1964-1984 remission. Figure 7 and Table 1 show the same pattern.

The table shows there was no remission of debt growth during the Great Inflation, and the graph confirms the fact.

⁹ The Excel spreadsheet supporting Table 1 is available via this URL: <https://docs.google.com/open?id=0B-pyd4Usl6QkZEIBd3hSd1I6dTQ>

It is a simple matter now, to visualize the erosion of debt. Figure 8 shows the blue line from Figure 7, as a percent of the red line from Figure 7:

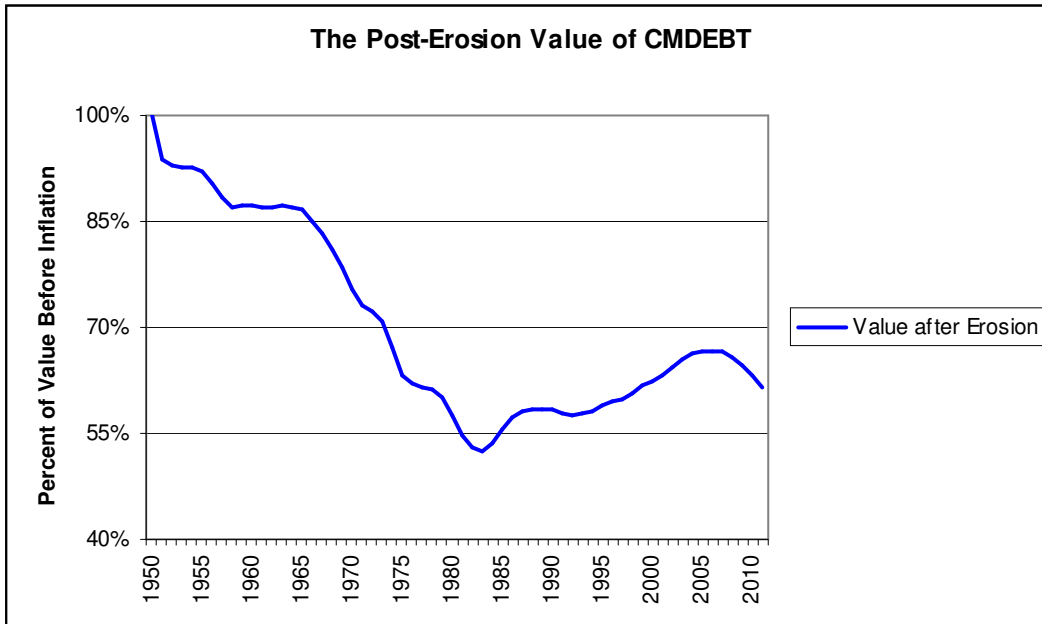


Figure 8: The Erosion of Debt by Inflation

If we wish to consider the erosion of debt by inflation, it is necessary to see debt in the context of income. “Debt relative to GDP” graphs show debt in the context of income. Figure 8 shows the ratio of two such graphs. It shows the effect of inflation on the ratio of debt to income.

Figure 8 shows nominal values as a percent of real values. The nominal values show a striking fall during the Great Inflation of 1965-1984. That fall was a result of inflation. That fall was “erosion” of debt. The incremental adjustment of debt allows us to see it.

Debt accumulating since 1950 held more than 85% of its real value until the mid-1960s. It rapidly lost value during the Great Inflation, the number falling to less than 55% by 1984. Thereafter, erosion reversed its course.

Conclusion

There are two topics that run through this paper. One is Sumner's "debt surge" analysis. The other is the calculation of inflation-adjusted debt. How are these topics related? The ratio under consideration by Sumner and others is the ratio of debt to GDP. Inflation affects both debt and GDP. So a question is forced upon us: **Does inflation affect debt and GDP equally?**

By chance, perhaps, the idea of reducing debt by a policy of increasing inflation has lately been circulating. Reducing debt by increasing inflation has been called the "erosion" of debt.

But if inflation can "erode" debt, then surely inflation must affect debt and income differently. Our question answered, new questions are forced upon us: **Why** do our graphs fail to show the erosion? **How** can this problem be corrected? **What** will the corrected graphs show?

This paper is an attempt to answer these questions.

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