Inflating our troubles away.

Comments on "Inflating away the public debt? An empirical assessment"
by Jens Hilscher Alon Aviv and Ricardo Reis

John H. Cochrane[*]

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Long Term Debt

Consider the government debt valuation equation, which states that the real value of nominal government debt equals the present value of primary surpluses.

My first equation expresses this idea with one-period debt, discounted either by marginal utility or by the ex-post return on government debt.

$$\frac{B_{t-1}}{P_t} = E_t \sum_{j=0}^{\infty} \beta^j \frac{u'(c_{t+j})}{u'(c_t)} s_{t+j} = E_t \sum_{j=0}^{\infty} \frac{1}{R_{t,t+j}} s_{t+j}$$

(P is the price level, B is the face value of nominal debt coming due at t, s are real primary surpluses, R is the real ex-post return on government debt.)

This paper's question is, to what extent can inflation on the left reduce the value of the debt, and hence needed fiscal surpluses on the right. The answer is, not much.

The first equation seems to offer some hope. If you change P_t by, say 30%, then you devalue nominal debt B by 30%, and you can lower the steady state surpluses needed to pay off the debt by 30%.

The trouble is, this only works for an *unexpected* 30% price level *jump*. 3% a year for 10 years won't do it. If people expect inflation starting next year the governments gets precisely nothing out of it. Nominal interest rates rise, and short term debt completely avoids devaluation by expected inflation.

Exchange rate jumps are easier to engineer, and as the paper documents a lot of US debt is held abroad. So there is a bit more of a chance that devaluation can work, which would be an interesting extension.

$$\frac{\sum_{j=0}^{\infty} Q_t^{(j)} B_{t-1}^{(j)}}{P_t} = ... = E_t \sum_{j=0}^{\infty} \frac{1}{R_{t,t+j}} s_{t+j}$$

My second equation expresses the government debt valuation equation with long term debt. ($Q^{(j)}$ is the nominal bond price of maturity j zero-coupon debt, and $B^{(j)}$ is the outstanding quantity.)

Long term debt has several useful properties for government finance. With one-period debt, shocks to the present value of surpluses s are reflected immediately in the price level P_t. With long-term debt, nominal bond prices Q can decline instead and absorb some or all of the fiscal shock. Declining bond prices reflect future price level rises, so long term debt helps really by spreading the inflationary impact of the fiscal shock across time. Similarly, long-term debt buffers the fiscal impact of interest-rate shocks, as it does for a household choosing a fixed vs floating rate mortgage. Interest rate increases do not affect debt service until the debt rolls over.

Long-term debt helps for this paper's question as well.

The presence of outstanding long-term debt allows the government to devalue debt claims via expected and therefore slow-moving inflation. Higher expected inflation lowers bond prices Q, resulting in lower future surpluses, even with no change in the current price level P_t.

Figure 1 gives a very simple example. At time 1, debt of four maturities is outstanding. The government will pay off this debt with four surpluses. The surplus required at each date is then the real value of the arriving coupon. If at time 1 the government raises the price level at times 2, 3, 4, then it will have to run lower surpluses at those dates to pay off the debt. (In general the dynamics are more complex as the government will roll over some of this debt, but the point remains true.)

Alas, the US does not issue much long-term debt. Figure 2 is a plot of the cumulative distribution of debt – each point is the amount of debt of that or greater maturity – using the author's data. About half the debt is less than one year maturity – the US rolls over half its debt every year. Two thirds of the debt is less than three years maturity. (This figure
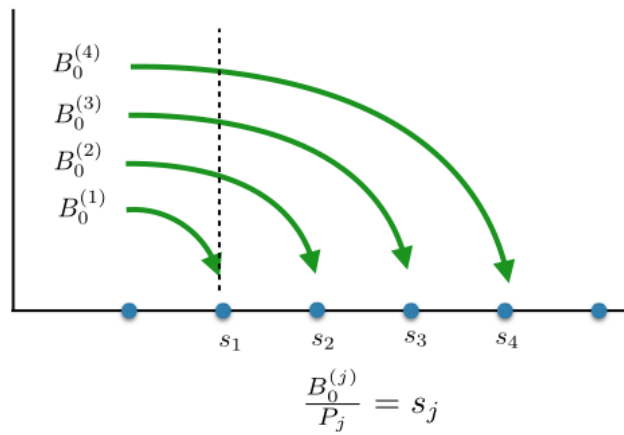
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$$\frac{B_0^{(j)}}{P_j} = s_j$$

Figure 1: Long term debt example.

is the cumulative analogue of the paper's figure 1. I added back currency and reserves. The paper subtracted Fed holdings of Treasuries but did not add back the corresponding liabilities. This change only affects the leftmost point.)

Thus, for example, an announced 30% inflation in year 3 only results in a 10% reduction in the value of the debt. The slower, smaller, and longer-lasting inflations considered in the paper have correspondingly smaller effects.

That's the basic message of the paper. Inflation trundling along with its current variance is quite unlikely to do anything like that. And conceivable deliberate inflation, even if our Fed knew how to achieve it, would have limited effects.

The budget-busters

The paper announces its goal as,

" ... to quantify the likelihood of inflation significantly eroding the real value of U.S. debt."

I want to generalize the quest, and ask "To what extent can greater inflation significantly improve the US fiscal situation?" And I want to ask the converse, "To what extent is the US fiscal situation likely to result in inflation?" Both questions allow me to comment a bit on the larger issues raised in this conference as well.

A government is tempted to default via inflation if debt service requires onerous taxation. At a steady state, surpluses must be r-g times the debt/GDP ratio.

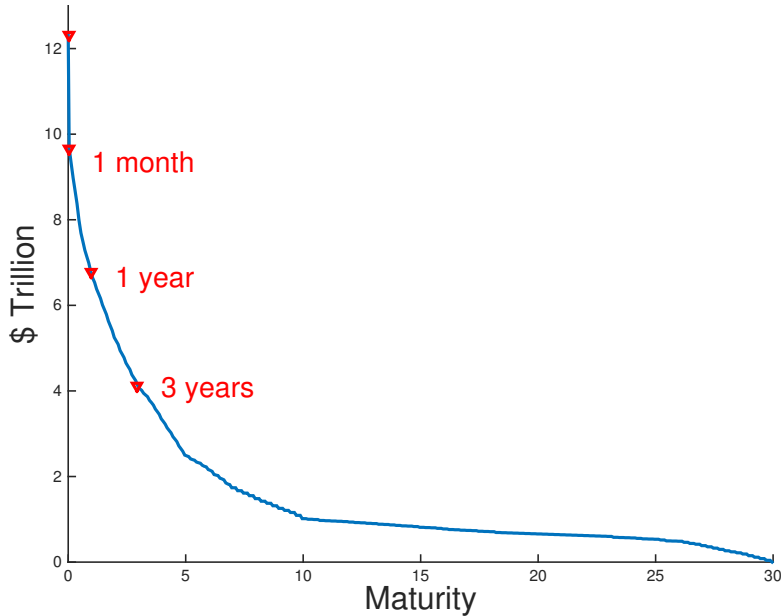**Federal debt due on or before each maturity in 2012**

Figure 2: Cumulative US Federal Debt in 2012. Each point plots the total zero-coupon debt coming due after that date. Data source: Hilscher Aviv and Reis.

	% of GDP	2017 $
Debt service	< 0.5% - 1%	$95b - $190b
CBO deficits	3% (2017) - 5% (2027)	$550b - $950b
Kotlikoff fiscal gap	10.5%	$2,000b

Table 1: Components of primary surpluses.

$$b_t = \frac{B_{t-1}}{P_t} = E_t \sum_{j=0}^{\infty} \frac{1}{R^j} s_{t+j}$$

$$\frac{b}{Y} = \frac{s/Y}{r-g} \quad \rightarrow \quad \frac{s}{Y} = (r-g)\frac{b}{Y}$$

But r minus g is perilously close to zero! So current debt at current interest rates requires at most something like half to one percent of GDP debt service, or $75-$150 billion dollars a year. Table 1 adds up components of primary surpluses and deficits.

(Throughout I ignore the possibility that $r - g$ is negative, that markets will support arbitrarily large debt/GDP ratios. If so, government debt is a literal money tree, and

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there is no problem to start with. The eventual end of the Earth when the sun becomes a red giant is enough to put a stop to it. Moreover, I am increasingly convinced by the Chad Jones revision of growth theory that economic growth must eventually be linear, not geometric, so the right value of g is zero in the long run.)

The CBO reports[1] this year's deficit at \$550 billion or 3% of GDP, and rapidly rising to \$1.4 trillion or 5% of GDP by 2027. That's already a lot bigger than debt service. (CBO forecasts cite appalling debt service amounts, but those are largely debt service on debts still to be incurred as primary deficits spiral. You can't inflate away debts you haven't yet incurred.)

The US' big fiscal challenge is looming primary deficits. And those fundamentally come from social security, medicare, medicaid, pensions, and voluminous explicit or implicit credit guarantees.

One way to think of the long-run entitlements problem is as "debts," that should be included on the left hand side. Larry Kotlikoff[2] computes a "fiscal gap" of \$210 trillion, dwarfing the \$13 trillion or so of publicly held Federal debt.

(The paper acknowledges but ignores these issues, for the reason that they are hard to measure.

> "Unfunded nominal liabilities of the government like Social Security could be included in B_t^j, and the real assets (and real liabilities) of the government could be included in K_t^j. Theoretically, they pose no problem. In practice, measuring any of these precisely, or taking into account their lower liquidity, is a challenge that goes beyond this paper, so we will leave them out."

But the debts are large, so cast a big shadow on any calculation that ignores them.)

These numbers are imponderably huge, and sensitive to interest rate assumptions. I think it's easier to digest them by translating into flows. Kotlikoff's fiscal gap is 10.5% of his present value of GDP. So, to fix it, either Federal taxes must rise by 10.5 percentage points of GDP, from roughly 20% to roughly 30%, or spending must be cut by 10.5 percentage points of GDP. Permanently. Now.

(By the way, if you're feeling superior and taking comfort that Europe will go first off the cliff, Kotlikoff disagrees. Europe's debts are larger, but their social programs are better funded, so their fiscal gaps are much lower than ours. The winner, it turns out, is Italy with a negative fiscal gap. Answering the obvious question, Kotlikoff offers

> "What explains Italy's negative fiscal gap? The answer is tight projected control of government- paid health expenditures plus two major pension reforms

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[1]https://www.cbo.gov/publication/52370

[2]http://kotlikoff.net/sites/default/files/Kotlikoffbudgetcom2-25-2015.pdf

that have reduced future pension benefits by close to 40 percent."

Don't get sick or old in Italy, but perhaps buying their bonds is not such a bad idea.)

Viewed as flow or present value, it's clear that today's debt or debt service, at current real interest rates, is just not a first-order issue for confronting US fiscal problems.

We can, and should, still ask the question whether inflation would help or hurt. To first order, the answer seems to be not much. Social security is explicitly indexed, and health care costs are real. Many union contracts have cost of living clauses.

To second order, inflation may matter. "Inflation is the dean's best friend," a dean once told me. Non-indexed government wages may be slow to adjust. Medicare and medicaid reimbursement rates are sticky, with so little price discovery and competition left in health care, so real government health expenses may lag inflation. Many government pensions remain defined benefit. And inflation remains the friend of the tax code, including taxing inflationary capital gains, devaluing unused depreciation allowances and nominal loss carry-forwards.

Yes, calculating the inflation sensitivity of entitlement "debts" is hard. But I suspect it does matter at least as much as inflating away the current debt, so if the question is worth asking, this answer is worth calculating. I also suspect the answer will still be that you're not going to get $2 trillion of annual surpluses or Kotlikoff's gazillions of present value out of inflation.

(The paper acknowledges the fact,

> "Higher inflation may not only lower the real payments on the outstanding nominal debt, but also change primary fiscal surpluses."

but, reasonably given its scope, does not address it. This is is, appropriately, a suggestion for future research.)

Anytime debt and inflation comes up, so does seignorage. One way to think about it is that seignorage too provides a way for higher inflation to help current surpluses, rather than just be devaluing debt. Seignorage, rather than debt devaluation is the main mechanism in Sargent and Wallace's models of hyperinflations.

Currency is now $1.4 trillion. Reserves are trivial when they do not pay market interest. 10% inflation would generate $140 billion of surplus. However, currency demand falls when inflation rises. Currency, now about 7.5% of GDP, was less than 4% of GDP in 1980, and that was before electronic payments. So seignorage is probably capped for the US at something like $50 billion per year, and not really going to make a dent.

The paper says, "In companion work (Hilscher, Raviv and Reis, 2014), we measure one of these effects through the seignorage revenues that higher inflation generates."

How will it work out? Or not? How might inflation happen?

$$b_t = E_t \sum_{j=0}^{\infty} \frac{1}{R^j} (\tau Y_{t+j} - G_{t+j})$$

$$b + PV(G) = \frac{\tau Y}{r - g}$$

So how will our fiscal problems work out? Remember this equation holds, ex ante and ex post. If current projections don't add up, something is going to change in those projections, and those projections do not correspond to expectations driving the market value of debt. So our question is, how does it hold ex ante – why do agents value government debt so highly – and how is it going to hold ex post?

Most obviously, there could be fairly massive cuts in entitlement programs, G relative to current projections. These are not really "debts." Cutting them does not entail formal default. Beneficiaries cannot sue, grab assets, and most of all cannot run or refuse a roll-over. All they can do is vote. I suspect that markets are betting on eventual entitlement reform.

The equation can hold ex-post from massive negative returns, i.e. an eventual default or large inflation, after a large amount of additional debt has been issued. Naturally, that must be unexpected.

More growth is the most sunny possibility. If $r - g$ is 2 minus 1, all it takes is one percentage point more sustained growth g to double the value of tax receipts. In my view, that is not an outlandish hope for what tax and regulatory reform could do, along with the fruits of today's software and biotech. This view may also help to account for the market's high valuation of US debt.

(For growth to solve the fiscal problem, we must assume that the government does not choose to raise health and pension entitlement spending with higher GDP. But that would be a choice – the entitlements are not GDP indexed.)

What about raising taxes? Absent other cures, we are likely to get much higher taxes eventually, but I think they are much less likely to work. With our current preferences for progressive taxation, and on top of state and local government taxes (and their own problems), ten percentage point higher federal taxes are going to put many current economists' dreams, and Art Laffer's fears, of confiscatory high-income and wealth taxation to the test.

$$\frac{d}{d \log \tau} \left(\frac{Y}{r - g} \right) = 1 + \frac{d \log Y}{d \log \tau} + \frac{1}{r - g} \frac{dg}{d \log \tau}$$

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To think about this, I wrote down here the elasticity of the present value of tax revenue with respect to tax rate. The second term is the conventional static Laffer term, which most people think is small. The important point is the third term, which I call the present-value Laffer term. Because r-g is so small, 0.01 or 0.02, it takes only a tiny growth effect effect of taxes to destroy the present value of tax receipts. If Laffer effects take time and affect growth– if they affect occupational choice, entrepreneurship, long-term R&D investment, business formation and so on – they can destroy the present value of tax revenue, even though we may never see declines in the level of income. " (Considering labor effort, a higher flat tax rate has equal income and substitution effects, so conventional wisdom assigns a small labor-effort elasticity. One can argue – more progressive taxes have substitution but not income effects – and there are many other channels for static Laffer elasticities. But my point is to focus on the third term and dynamic Laffer effects, so I ignore this one here.

As in all my calculations, we do not have to have a "growth effect" vs. "level effect" argument. Growth that lasts 20 years due to a level effect with transition is enough; permanent growth just gives very simple formulas.)

Finally, let's ask how the equation might fall apart – i.e. result in an unexpected deflation or default. Let's separate out tax receipts and the troublesome spending driven by entitlements,

$$b_t = E_t \sum_{j=0}^{\infty} \frac{1}{R^j} (\tau Y_{t+j} - G_{t+j})$$

or in present value terms, with Kotlikoffian "debt" on the left hand side,

$$b + PV(G) = \frac{\tau Y}{r - g}.$$

As a little more g would help a lot, a little less g would hurt a lot. Each point of stagnation makes our governments promises more and more unsustainable.

I think our most immediate danger is a rise in interest rates. If the real rates r charged to our government rise, say, to 5%, then the service on a 100% debt/GDP ratio rises to 5% of GDP, or $1 Trillion dollars. Now, debt service really does matter, and our outstanding stock of debt really does pose a surplus problem.

There are two mechanisms that might raise interest rates. "Not so bad" interest rate rises come as a natural consequence of growth. Higher per capita growth times the intertemporal substitution elasticity equals higher interest rate. If the elasticity is one, the interest rate rise "just" offsets the benefits of higher growth.

Conversely, low real interest rates can buffer the impact of lower growth. γ above one and r thus falling more than g may be a reason why our current slow growth comes with rising values of government debt.

"Really bad" interest rate rises come without growth, from a rising credit spread – the Greek scenario. If markets decide that the entitlements are not going to be reformed, cannot be taxed away or grown out of, they will start to charge higher rates. Higher rates explode debt service, make market more nervous, and so forth until the inevitable inflation or default hits. In present value terms, higher r can quickly make the present values on the right implode.

Here, I find the most important implication of this paper's calculations. The paper shows that the US has a very short maturity structure, so higher interest rates turn into higher debt service quickly. The paper shows that a large slow inflation results in a small change in the present value of surpluses. It follows, inexorably, that if a small change in the in the present value of surpluses has to be met by inflationary devaluation, that inflation must be large, and sharp. If x is small, $1/x$ is large.

We – and the rest of the low-interest rate, high-debt, big-promised-entitlement, frequent roll-over word – live on the edge of a run on sovereign debt. That, I think, is the big takeaway from this paper – and this conference.