Understanding fiscal and monetary policy in 2008-2009: Some unpleasant fiscal arithmetic

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1 Introduction

There are two equilibrium conditions in every monetary model; the valuation equation for government debt, and the money demand function:

$$\begin{aligned} \frac{M_t + B_t}{P_t} &= E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t,t+\tau}} (T_{t+\tau} - G_{t+\tau}) d\tau \\ M_t V(i_t, \cdot) &= P_t Y_t. \end{aligned}$$

My goal in this essay is to think through the current situation and outlook guided by these two simple equations, in they style of Sargent and Wallace's famous "Unpleasant Monetarist Arithmetic." Obviously, this is the beginning, not the end. More complex and more realistic models and effects layer on top of these. However, we should start at the beginning, and these two basic equations let us sort through many controversies.

We normally ignore the fiscal equation. We think that the government can adjust revenues ex post to validate whatever monetary policy does. But these are not normal times. At some point, the fiscal constraint must bite, and this might be that point.

The fiscal equation affects prices in an intuitive way. If people start to think surpluses will not be sufficient to pay off the debt, they try to unload government debt now, buying other assets or goods and services. This is just "aggregate demand."

This simple fiscal equation seems to predict sudden and unrealistic price-level jumps. However, it assumes overnight or floating-rate debt. With long term debt, the fiscal equation reads

$$\frac{M_t + \int_{j=0}^{\infty} Q_t^{(j)} B_t^{(j)} dj}{P_t} = E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t,t+t}} s_{t+\tau} d\tau.$$

Now, a surplus shock can be met by declines in bond prices Q – future inflation – rather than a price level jump. With long-term debt, the government can also trade off less inflation now for more inflation later by buying and selling long-term debt.

To bring these possibilities to life, I calculated three possible responses to a 10% surplus shock, calibrated from the maturity structure of US debt, and presented in Figure 1. The top graph is inflation, the bottom graph is price level

The red line shows a sudden 10% price level jump. This is still possible with long-term debt. However, the government can instead choose a sustained 3% inflation in the blue line.

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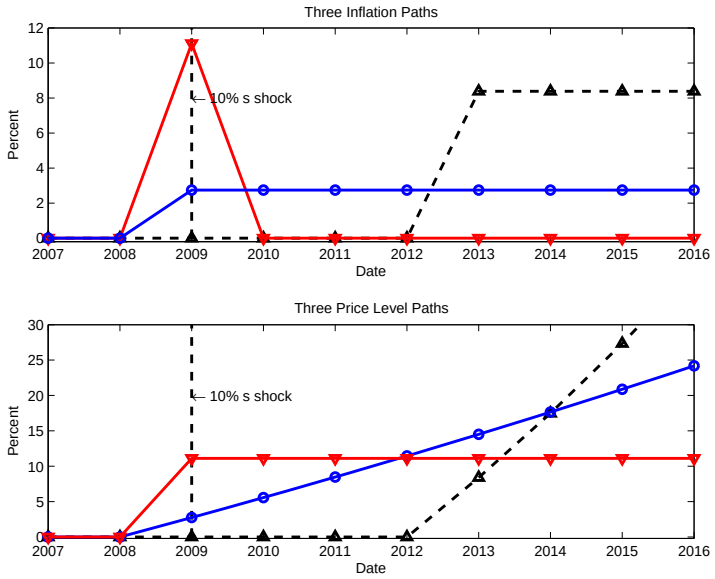

Figure 1: Three possible responses to a 10% surplus shock, calibrated from the maturity structure of U.S. Federal debt.

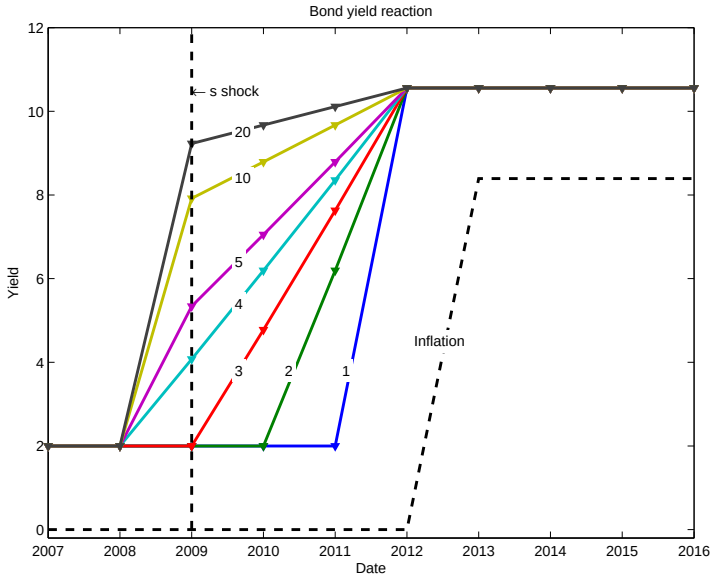

Figure 2: Interest rates and inflation in the delayed-inflation scenario response to a 10% surplus shock. The numbers give the maturity of each bond yield.

This choice trades a lower price rise immediately for larger price rises later. The government can even choose no inflation at all for 4 years, if it then allows an 8% sustained inflation.

Which path will it choose? Our government likes to smooth and delay inflation, for good reasons, so the last choice seems an interesting and plausible scenario to think about.

To bring it to life a little more, Figure 2 presents interest rates and inflation in the last scenario. Numbers give bond maturities. When the shock hits, long term rates rise. Short term rates rise later, and finally inflation shows up.

So, when you think of a "fiscal inflation," think of this. We are likely to see first a "flight from the dollar" or a "conundrum" in long term rates, followed by a gradual, insidious but unstoppable inflation, not a price-level jump. And I haven't added any price-stickiness yet.

I'm going to go back to the simple equation for the rest of the talk, to keep it simple. That works so long as we apply it on a time-scale consistent with the average maturity of government debt, a year or two, rather than days.

So, armed with our two equations, let's think about what happened and where we're going.

2 Fall

Last fall, we saw a dramatic contraction, a "fall in aggregate demand." I don't think $MV = PY$ sheds much light on this event. People did want more money – but the Fed provided trillions of dollars, sending interest rates to zero and beyond.

People didn't want more money and less government debt. At zero rates, these are perfect substitutes, especially for a bank. *They wanted more of both*, and less *private* debt, a "flight to quality."

Figure 3 presentssome indicators of the flight: Government rates fell while private rates rose. Quantities were more dramatic; private markets basically dried up. The dollar strengthened 10% in a month despite a stock market crash.

Now, our first question is this: How did a "flight to quality" "lower aggregate demand?" Well, a flight to quality means people are willing to hold government debt despite lower returns. A decline in required return R raises the value of the right hand side, so it's deflationary, a reduction in aggregate demand

$$\frac{M_t + B_t}{P_t} = E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t,t+\tau}} s_{t+\tau} d\tau.$$

This is, to me, an exciting observation. As we understand stock price variation by changing risk premiums not cashflows, we might understand a lot of historical aggregate demand variation by changes in discount rates R rather than changes in s expectations.

The second question is understanding the policy response. As the Fed accommodated desires for M vs. B, I think we can understand a lot of the government's policy response as accommodation for "more of both." Many of the Fed's new facilities basically took in private debt and gave out treasury bills. Debt guarantees effectively transform private debt to government debt. And of course, the government increased the supply of both M and B dramatically.

How do these actions raise aggregate demand? When the government buys private debt, the fiscal equation includes it as D on the left, with proceeds included in s. If a "flight to

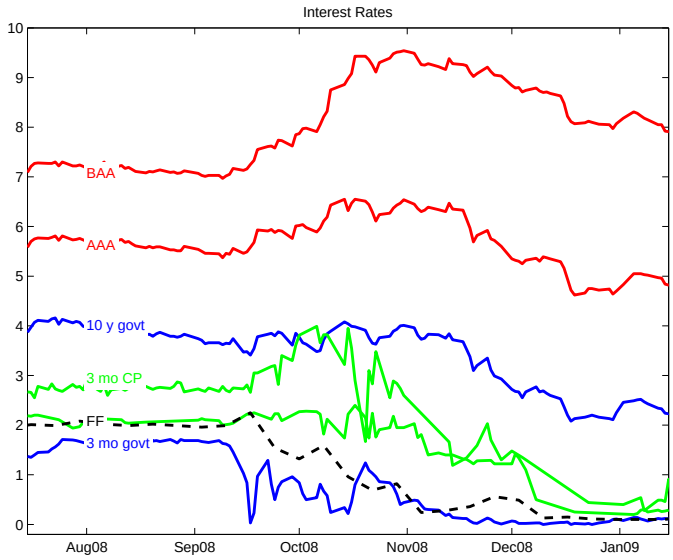

Figure 3: Interest rates in the financial crisis.

quality" lowered R, satisfying this demand should increase R, which depends on the supply of "special" government debt. Thus, an "open market debt operation" that switches D for B can increase R, and therefore increase aggregate demand. A raw increase in M and B can do the same thing, even if it's "Ricardian," i.e. matched by rising s expectations.

$$\frac{M_t + B_t - D_t}{P_t} = E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t,t+\tau}(M+B,\cdot)} s_{t+\tau} d\tau$$

2.1 Fiscal stimulus

In the winter, the policy debate and response focused on fiscal stimulus. Can this work in our simple framework?

The fiscal equation

$$\frac{M_t + B_t}{P_t} = E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t,t+\tau}} s_{t+\tau} d\tau$$

says yes, *if* greater debt and lower short term surpluses are not matched by higher long-term surpluses. "Non-Ricardian" expectations can be perfectly rational with nominal debt.

We can also address some controversies. Some people say "the spending will come too late." In this framework, that doesn't matter. Future deficits are just as stimulative as current ones.

What *does* matter is to convince people that long-term future deficits are really going to be horrible – "you'd better spend that cash and get rid of that government debt now, because we're not raising taxes to pay it off." The stimulus and budget in February were remarkable not so much for current year spending, but by the dramatic long-term deficit forecasts. That makes sense in this context.

However, by spring, the Administration turned to "fiscal responsibility" and stated concern about long-term deficit reduction. Maybe they thought twice about whether a deliberate fiscal inflation was such a good idea. However, in this framework, that means the effort will lose any hope of "stimulative" effect.

2.2 Monetary stimulus

Interest rates fell near zero. (Figure 4.)

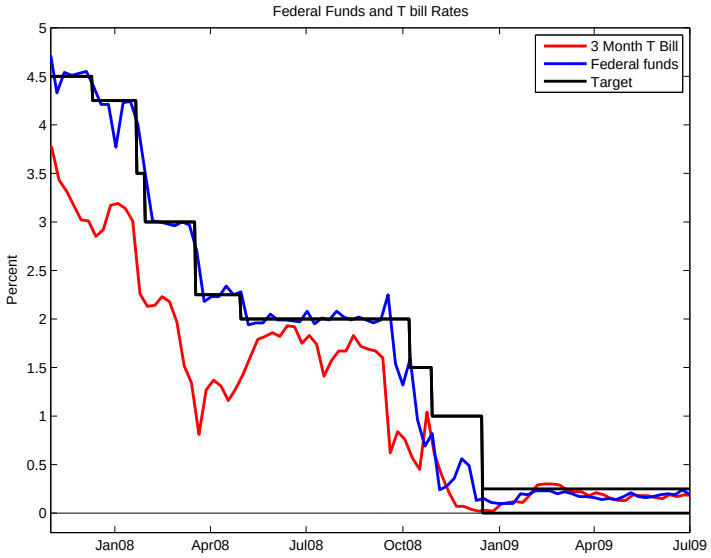

Figure 4: Federal funds rate, Federal funds target, and 3 month T bill rate.

That does not mean monetary policy can do nothing. Central banks can and did turn to dramatic "quantitative easing," increasing M by buying both government B and private D debt. (Figures 5 and 6.)

Can this work? Let's look at our equations.

$$\begin{aligned} \frac{M_t + B_t}{P_t} &= E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t,t+\tau}} s_{t+\tau} d\tau. \\ M_t V_t(i_t, \cdot) &= P_t Y_t \end{aligned}$$

At a zero interest rate, M and B are perfect substitutes, especially to a bank. People trade perfect substitutes at will, so trading M for B can't do anything in either equation. Velocity V just adapts.

What about a helicopter drop? "More M" might help – but only through the fiscal equation, and *if* we persuade people that future s will not rise. If people think money dropped from helicopters will be taxed away tomorrow, even a drop has no effect. And dropping debt B from helicopters would have the same effect.

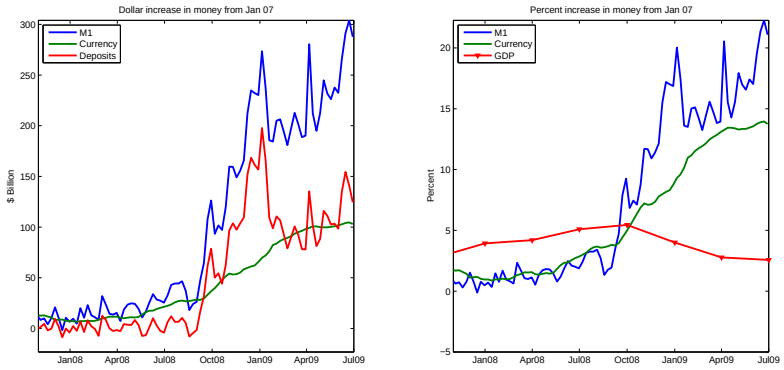

Figure 5: Money stock measures.

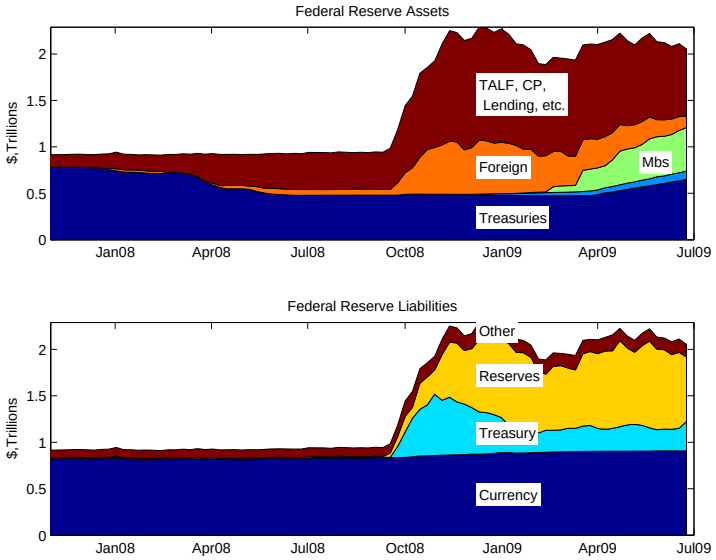

Figure 6: The Fed's balance sheet.

So we're back to fiscal inflation, really. The point of the helicopter is to dramatically change *fiscal* expectations, to persuade people that *this* money or debt will not be taxed away.

In sum, you can't *inflate* at zero rates without convincing people of the *lack* of fiscal backing. This may be the story for Japan in the 1990s – they never convinced markets that they really would not pay back the debt somehow, and perhaps wisely.

3 The inflation outlook

Now, to the future. Are we headed for inflation or deflation? Again, let's look at our equations

$$\begin{aligned} \frac{M_t + B_t}{P_t} &= E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t,t+\tau}} s_{t+\tau} d\tau \\ M_t V_t(i_t, \cdot) &= P_t Y_t. \end{aligned}$$

As you have seen, we have a huge – roughly $1 trillion – monetary expansion in place, and velocity may soon fall. Does this mean inflation?

The first question is, *will* the Fed soak up the extra cash – will it trade M for B, and let short term rates rise? The obvious dangers are the political will, and the eternal danger of overestimating potential output. Now that the Fed has intervened in so many markets, it is also politically vulnerable to interest rate rises in all those markets. This is important, but my equations don't have anything special to say about political will.

Can the Fed soak up the extra cash? If we run up against the fiscal limit, and everyone else is selling T bills, can the Fed sell a trillion dollars more? I used to think no, but the equations force another view – M vs. B transfers are free, since people are already holding the M. So the answer is yes, the Fed *can* easily soak up extra cash if it wants to. There are no real fiscal constraints on open market operations.

So we're down to one final worry: will there be a fiscal inflation, a decline in expectations of future s and rise in the risk premium attached to government debt R, something like the scenario I showed you a few slides ago?

I don't need to remind you that all fiscal projections are "unsustainable." For example, Figure 7 presents the CBO's long-term budget outlook; the top line is their more plausible scenario. Be scared, be very scared.

On the other hand, the major long-term problems here are health care and other entitlements, not the recent stimuluses. Markets have long discounted drastic projections, figuring that sooner or later the government will cut benefits. Will they? I don't know, but at least we've cut through to the essential question.

The equations do allow me a few novel points, and to address common controversies on this issue.

1. The fiscal equation is just like the stock valuation equation. It suggests that flight; a revision of s expectations and R risk premiums, happens quickly and unpredictably, like stock market or currency crash.

2. There need be no warning signs that most writers expect. There is no bright line debt/gdp ratio. We need not see large current deficits, "crowding out" or other signs of stress.

3. Some people worry that the "Fed will have to monetize deficits causing inflation," but in doing so they are reassured that inflation will not happen until after that event. No, the inflation can come before or even without seignorage.

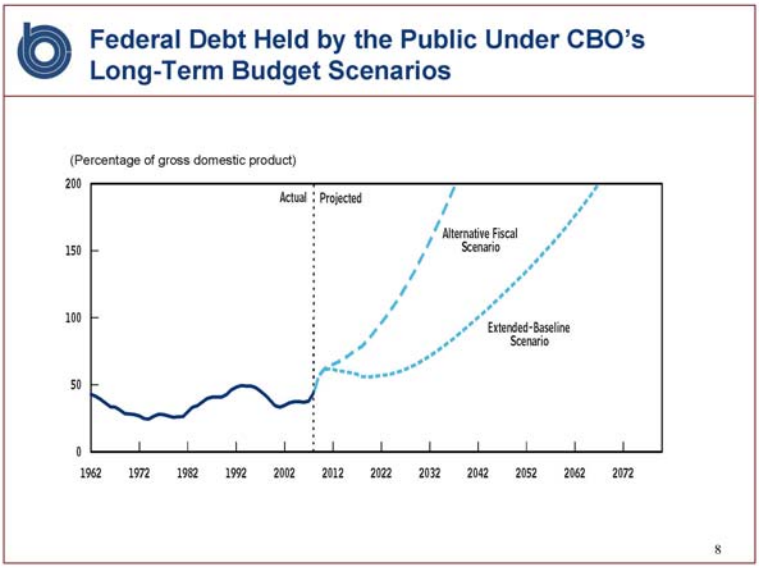

Figure 7: CBO long term budget forecasts.

4. Inflation helps the government's real position. Credit guarantees and sticky nominal commitments (wages of government workers, nonindexed transfers) all get better. The bad news is that this means that the government is more likely to choose inflation rather than distorting taxes to raise s. The good news is, it means a smaller price level rise will reestablish the fiscal equation.

5. The fiscal constraint is on *present values*, so there is a second term to Laffer calculations. If higher tax rates slow the growth of total GDP, the Laffer limit is much closer than you think. For example, with a constant growth rate g and proportional taxes τ, $s_t = \tau Y_0 e^{gt}$, and

$$\frac{\partial \log \int \frac{1}{R_{t,t+\tau}} s_{t+\tau} d\tau}{\partial \log \tau} = 1 + \frac{\partial \log Y}{\partial \log \tau} + \frac{1}{r-g}\frac{\partial g}{\partial \log \tau}$$

   Using this formula, if raising the tax rate from 30% to 35% causes a 30 basis point reduction in growth, $\partial g / \partial \log \tau = -0.003/0.15 = -0.02$ so if $r - g = 2\%$, the last term means we're past the Laffer limit, even without the conventional middle term. Slow growth, as in the late 70s, is a big danger that may spark a fiscal inflation.

4 Stimulate or stagflate?

Many authors think "a little inflation would be a good thing." Many more, including the Fed, say we shouldn't worry about inflation yet, as there is still lots of "slack," unused capacity, and "big gaps."

Well, will a fiscal inflation reduce gaps, and will we be warned by declining gaps? Or will it be a stagflation?

I'm worried. Historically, fiscal inflations and currency collapses have come with terrible real outcomes. If inflation always meant a boom, Zimbabwe would be the richest country in the world. Monetary theory already envisages many circumstances of neutrality or stagflation: currency reforms, supply shocks, "loss of anchoring." Expecting inflation always to come with a boom ignores a lot of sorry history.

What we need is a well-worked out theory, confirmed by experience, of fiscal inflations with non-neutralities; adding price stickiness to the model perhaps in the standard form.

$$\pi_t = \beta E_t \pi_{t+1} + \gamma(y_t - \bar{y}) + v_t.$$

I haven't done it (yet), but as I start to think about this, it seems to me that the fiscal condition is a crucial part of "anchoring expectations," which writers of all stripes think is vital to successful monetary policy. Think about my scenario above; as inflation emerges, we have high current inflation but higher still expected future inflation, meaning lower output in this equation. That tips me toward suspecting a fiscal inflation will be a stagflation, not a boom.

5 Bottom line

I've looked at the world with two and a half simple equations.

$$\begin{aligned} \frac{M_t + B_t}{P_t} &= E_t \int_{\tau=t}^{\infty} \frac{1}{R_{t,\tau}} s_\tau d\tau \\ M_t V_t(\cdot) &= P_t Y_t \\ \pi_t &= \beta E_t \pi_{t+1} + \gamma(y_t - \bar{y}) \end{aligned}$$

In trying to make sense of events, policy, and arguments about the future, it seems the fiscal equation is surely at the center of events right now.

Will we get inflation? I don't do forecasts, so noone can prove me wrong, but certainly we can sketch the scenario, and rule out some others. The nightmare scenario starts with more fiscal troubles – bailouts, defaults, spending and no resolution of entitlements. Slow growth, perhaps from distorting taxes, makes the present value problem loom even larger.

If it comes, we will see little warning, but rather a fairly sudden flight from long bonds and the dollar, followed by intractable inflation. I suspect it will be associated with stagnation, not a boom; a "loss of anchoring."

The Fed seems to think inflation comes *only* from its rate choices, which affect demand and thus gaps. A fiscal inflation will come as a surprise to the Fed, as will the Fed's inability to do much about it.