Understanding fiscal and monetary policy in 2008-2009.

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June 17, 2009

1 Introduction

I offer an interpretation of the current (June 2009) macroeconomic situation and outlook focused on the fiscal situation of the U. S. government.

Every model of money and inflation includes some version of two equilibrium conditions, the valuation equation for government debt (sometimes called, mistakenly in my view, the government budget constraint) and a money demand equation,

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

(I will be more specific about the form of these equations below.) Sargent and Wallace (1981) (also Sargent 1992) used these two equations to understand disinflation in the 1980s and hyperinflation following the two world wars. I use the same framework, with a few nuances, to try to make sense of the current situation.

The fiscal valuation equation appears in *all* monetary analyses. This is not a question of new and different theory, it is only a question of how perfectly standard monetary and fiscal theory applies at the moment.

In "normal times" many monetary economists don't pay much attention to fiscal issues, and suppose that fiscal backing is not a serious constraint on monetary policy. For example Woodford's (2003) seminal book on interest rate policy acknowledges the fiscal equation, but

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[†]This paper was prepared for the conference on "Monetary-Fiscal Policy Interactions, Expectations, and Dynamics in the Current Economic Crisis" at Princeton, May 22-23 2009, and for the conference on "The Macroeconomy and Financial Systems in Normal Times and in Times of Stress" Deutche Bundesbank and Banque de France, 8-9 June 2009. I thank the participants for many useful comments.

quickly dismisses it with an assumption that the government will adjust lump-sum taxes on the right hand side to make it hold. This is not an unreasonable attitude. In "normal times" monetary influences on U.S. fiscal balance are minor. Seigniorage is a small component of the budget, and small slow changes in inflation have little impact on the real value of a sufficiently small amount of outstanding nominal debt.

But these are not normal times, and for this reason the fiscal condition may have more influence on affairs than usual. First, conventional monetary policy affects *split* of government debt holdings between "monetary" and "debt" assets. However, with interest rates on government bonds near zero, money and government bonds are nearly perfect substitutes, especially for the banks and financial institutions at the center of economic events. Therefore, monetary policy is powerless. Obviously, the Fed cannot lower interest rates below zero. "Quantitative easing," large purchases of debt B which increase money M, also can have no effect. Agents are happy to trade perfect substitutes at will; velocity V simply absorbs any further change in the composition of government debt. And with no change in the numerator on the left hand side of the fiscal equation, monetary policy has no effect on the price level through the fiscal channel either.

Second, massive fiscal deficits, credit guarantees, and Federal Reserve purchases of risky private assets raise the fiscal solvency question directly. At some point (rises in B_t, declines in s_{t+j}) fiscal constraints take hold. There *is* a limit to how much taxes a government can raise, a top of a Laffer curve, a fiscal limit to monetary policy. At this point, inflation must result from the fiscal equation no matter how the central bank attempts to split government liabilities between money and bonds. Long before that point, the government may choose to inflate and devalue rather than further raise distorting taxes. Argentina has found these fiscal limits. So far, the U.S. has not, at least recently. But unfamiliarity does not mean impossibility, and it's worth at least asking how far we are from the fiscal limit and how it will work.

Increasingly, media and commentators are discussing monetary events in fiscal terms. For example, on May 22 2009, UK government interest rates rose, and the pound fell. The precipitating event was an announcement by rating agencies that its credit might be downgraded. Surely, these events have nothing to do with the split of UK government liabilities between "money" and "bonds," or expectations of short-term interest rate policy. In the last week of May, media following large changes in long term bonds discussed them entirely in terms of "demand for U. S. debt," or concerns that "the U. S. would not be able to pay off its ballooning deficits," not in terms of expected future interest rates set by the Fed. I survey a range of op-ed writers on the Spring 2009 inflation vs. deflation debate, from Krugman to Laffer, and find they all are really debating only how far from a fiscal inflation we are.

After a quick review of the theory underlying the fiscal equation, I make the following points.

1. Fall 2008 saw a large increase in demand for both money and government debt, and a fall in "aggregate demand." These events makes sense in the fiscal analysis as a deflationary decrease in the discount rate for government debt. Many of the Government's

innovative policies can be understood as ways to accommodate this demand, which a conventional swap of money for government debt does not address.

2. Winter 2009 saw the announcement of dramatic fiscal stimulus in the U. S. and UK, and to a lesser extent by other governments, along with academic controversy over their effectiveness. Will "fiscal stimulus" stimulate? I show that surpluses can generate inflation (the same thing as "stimulate" in this analysis) if people do not expect future taxes to pay off the increased debt. However, unlike conventional "Ricardian equivalence" analysis, we do not need irrationality or market failure for this expectation, since our government debt is nominal.

   I show that *prospective* deficits are just as "stimulative" as current deficits, addressing the issue whether "fiscal stimulus" needs high current expenditure to work, and perhaps explaining the Administration's announcements of large future deficits.

   I ask, what *are* current expectations about future surpluses? The Government's announcements can be read both ways, in some ways promising unsustainable deficits that can stimulate while at others promising fiscal discipline that cannot. However, we can *measure* the state of private expectations in the bond market. We do not have to argue about "Ricardian equivalence" as a matter of economic theory or intuitive plausibility. If the private sector does not expect higher surpluses in response to debt issue, the government cannot raise revenue by bond sales. It just raises interest rates instead. The relatively steady behavior of interest rates (so far) and the fact that the government is collecting a lot of revenue suggests "Ricardian" expectations and hence not much stimulus.

3. Expanding on the above short analysis I show that quantitative easing cannot inflate, especially in the zero-interest rate environment. If we want inflation, it must be by somehow convincing people that the government will not raise taxes or cut spending to pay off deficits.

4. I examine the outlook for inflation. The easy question is, *will* the Fed soak up all the money it has issued? The harder question is, *can* the Fed do so? Or will we run in to the fiscal limits of monetary policy – will the Fed try to sell Treasuries just as everyone else is trying to do so, and no credible future surpluses can justify new debt issues?

   In this context, I point out that credit guarantees make matters much worse than actual deficits suggest. I also point out that since the present value of deficits matters, if taxes have any effect on growth, the 'Laffer limit' of taxation may come much sooner than static analysis suggests.

5. Many economists think that a little inflation is ok, because inflations historically come with booms. However, I point out that fiscal inflations, and in particular inflations that come from collapsing expectations of deficits, may have quite different output effects both in theory and in experience. If inflation always corresponded to "more demand" and a boom, Zimbabwe would be the richest economy in the world. A fiscal inflation, an event outside recent U. S. experience, may well lead to stagflation, not a boom.

I conclude by pointing out how the current situation leaves really very little room for traditional monetary analyses. Focus on monetary aggregates, rules for the overnight federal funds rate, and managing expectations of interest rate policy, start to seem quaint in the face of fiscal limits.

2 Fiscal review

Before applying it to the current situation, I quickly review how the fiscal valuation equation works[1].

The valuation equation for government debt, states that the real value of government debt must equal the present value of future primary surpluses. In the simple case that the government only issues one-period debt it reads

$$\frac{M_{t-1} + B_{t-1}(t)}{P_t} = E_t \sum_{j=0}^{\infty} m_{t,t+j} s_{t+j} \tag{1}$$

where M_{t-1} is money outstanding at the beginning of period t, $B_{t-1}(t)$ is one-period debt outstanding at the end of $t-1$ and due at t, $m_{t,t+j}$ is the real stochastic discount factor, which we can also think of as a discount rate $1/R_{t,t+j}$, and

$$s_t = T_{t+j} - G_{t+j} + \frac{M_{t+j}}{P_{t+j}} \frac{r^f_{t+j}}{1 + r^f_{t+j}}$$

are real primary surpluses including seigniorage[2].

Suppose there is bad news about future surpluses. Equation (1) predicts inflation *now.* Loosely, a fall in surpluses means that current debt will be paid off by printing money in the

[1] Many of the points in this section are treated at more length in Cochrane (1998), (2001), (2005). These papers contain bibliographic reviews, which more properly attribute credit for the ideas, which I will not attempt here.

[2] To derive (1), start with the nominal flow budget constraint

$$M_{t-1} + B_{t-1}(t) = P_t \left(T_t - G_t\right) + M_t + Q_t^{(1)} B_t(t+1)$$

where $Q_t^{(1)}$ is the one-period nominal bond price,

$$Q_t^{(1)} = E_t \left(m_{t,t+1} \frac{P_t}{P_{t+1}} \right) = \frac{1}{1 + r^f_t}.$$

Then substitute for $Q_t^{(1)}$,

$$\begin{aligned}
\frac{M_{t-1} + B_{t-1}(t)}{P_t} &= (T_t - G_t) + \frac{M_t}{P_t} \frac{r^f_t}{1 + r^f_t} + \frac{M_t}{P_t} E_t \left(m_{t,t+1} \frac{P_t}{P_{t+1}} \right) + E_t \left(m_{t,t+1} \frac{B_t(t+1)}{P_{t+1}} \right) \\
\frac{M_{t-1} + B_{t-1}(t)}{P_t} &= (T_t - G_t) + \frac{M_t}{P_t} \frac{r^f_t}{1 + r^f_t} + E_t \left(m_{t,t+1} \frac{M_t + B_t(t+1)}{P_{t+1}} \right)
\end{aligned}$$

and iterate forward.

future, meaning future inflation. If we all know there will be inflation in the future, we try to get rid of money and government debt now, leading to current inflation.

This fiscal price-equilibrating mechanism feels to participants exactly like "aggregate demand," or a "wealth effect" of government debt. There is nothing unusual or unfamiliar about it. If the present value of future surpluses is less than the value of debt, people try to get rid of that debt, buying goods and services instead. This extra "demand" raises the price level to its equilibrium level.

More deeply, "aggregate demand" is really just the mirror image of demand for government debt. The household budget constraint says that after-tax income must be consumed, invested, or result in purchase of government debt,

$$C_t + I_t + \frac{\dot{M}_t + \dot{B}_t}{P_t} = Y_t - T_t$$

The only way to plan to consume *and* invest more is to plan to hold less government debt.

For this short paper, I will not be specific about a price-stickiness or other mechanism that can translate inflation and deflation in these simple equations to temporary rises and (in 2008-2009) falls in output. I will identify events that would cause changes in the price level in a frictionless economy, and infer that these may be responsible for changes in output. I close with a cautionary thought that all kinds of inflation may not be the same for affecting output, and that some kinds of fiscal inflation in particular seem associated with stagnation not booms.

Money and debt appear symmetrically in (1). To understand monetary policy, which may affect the price level by the split of government liabilities between money and debt, we also need a money demand function, that captures the "special" nature of money,

$$M_t V(\cdot) = P_t Y_t. \tag{2}$$

The notation $(\cdot)$ reminds us that many variables can affect velocity. Interest rates are a conventional argument of velocity $V(\cdot)$, but Fall 2008 emphasized that other arguments belong as well, as there was pretty clearly a huge "precautionary" demand for money having nothing to do with interest rates.

Equations (1) and (2) each can determine the price level. Thus, government must arrive at a "coordinated policy" by which monetary and fiscal policy agree on that price level. Successful monetary policy needs an appropriate fiscal backing; fiscal stimulus needs monetary cooperation. Again, many economists view the fiscal equation (1) as simply achieved in "normal times" by a commitment of the fiscal authority to raise or lower taxes to pay off debt for any price level. In times of fiscal stress or monetary impotence, the fiscal equation becomes a more important constraint on monetary policy or a direct determinant of the price level.

The influence of the fiscal valuation equation (1) on the price level works in some unusual ways. First, there is no first-order difference between money and bonds – only small seigniorage terms – so open market operations have second-order effects on the price level. Second, inside money is unimportant. All that matters is government debt relative to the surpluses

that will retire it. Third, a version of the real-bills doctrine emerges: If the government issues money or debt in exchange for assets of equal value, which can retire that debt in time, no inflation results. Fourth, the valuation equation (1) can determine the price level even in a frictionless economy with $M_t = 0$. To some, this is a paradox, to others it offers a great simplification and an attractive frictionless benchmark.

The timing of the fiscal equation (1) and the dynamic relationship between debt, surpluses and inflation are quite different with long-term debt. For example, if debt consists of a constant coupon c that is redeemed each period, with no other debt purchases and sales, then we have

$$\frac{c}{P_t} = s_t$$

each period, and the present value terms vanish. Equation (1) still holds in the form

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

where $B_{t-1}(t+j)$ denotes debt outstanding at the beginning of period t that comes due at period $t+j$ and $Q_t^{(j)}$ denotes the nominal price at t of j-period debt. Now, the market value of long term debt can absorb surplus shocks as well as the price level. In the coupon example, bad news about s_{t+1} raises P_{t+1}, which lowers bond prices $Q_t^{(1)} = E_t(m_{t,t+1} P_t / P_{t+1})$, so the numerator does all the adjusting at t rather than the dominator. More generally, the dynamic response of the price level to a decline in surpluses depends on the outstanding term structure of debt as well as the government's state-contingent plan for buying and selling debt of various maturities. In typical cases, as in this coupon example, the first impact of surplus news is a rise in long-term interest rates, and inflation only happens later.

This point is an important caution for high-frequency application of these simple equations. However, most U. S. debt has a fairly short maturity, so if we take a time interval of a year or two we will not go too far wrong by considering the simple case with only short-term debt.

In continuous time, the distinction between t and $t-1$ vanishes, so the fiscal equation (1) becomes

$$\frac{M_t + B_t}{P_t} = E_t \int_{j=0}^{\infty} \frac{M_{t+j}}{M_t} s_{t+j} dj$$

where B_t denotes the nominal market value of government debt. Given all the different forms, I will simply write

$$\frac{M_t + B_t}{P_t} = E_t \sum_{j=0}^{\infty} m_{t,t+j} s_{t+j}$$

to remind ourselves of the fiscal equation when the precise timing and maturity structure do not matter.

2.1 Controversies

The fiscal equation (1) has generated a surprising level of controversy.

Regimes

It is interesting to think about how fiscal-monetary coordination is achieved, i.e. how the government arrives at a policy configuration (choice of $\{M_t, B_t, s_t\}$) that satisfies both (1) and (2). The standard view is that (2) with monetary control or interest rate rules determines the price level, and then the fiscal authority follows a "Ricardian regime," raising or lowering taxes as necessary to pay off inflation or deflation-induced changes in the value of government debt so that (1) will hold. Another possibility is that the fiscal equation (1) determines the price level, and then money demand (2) determines M_t. Money is passive, for example via an interest rate target. (An exciting feature of joint fiscal-monetary analysis is that it can solve the indeterminacies that appear in some monetary policies.) However, real fiscal-monetary policy coordination is not so simplistic as these stylized theoretical treatments. History is full of interesting battles and hard-fought cooperation between monetary and fiscal authorities.

For my purposes, we do not have to take a stand on these issues or make a choice or diagnosis of "regime." We are never "choosing which equation holds." *Both (1) and (2) hold in every equilibrium* or regime, no matter how the government arrives at policy parameters to determine that equilibrium. In particular, even if one sticks firmly to a view that monetary policy chooses P, that choice must be consistent with a believable set of fiscal expectations. One can regard (1) as part of the "anchoring" of inflation expectations necessary for successful monetary policy. Thus, all my analysis can be framed, "is the fiscal backing of monetary policy adequate to properly anchor (or loosen the anchor of) inflation expectations?"

Budget constraint

Many critics[3] hold that the "non-Ricardian" regime in which (1) determines or even constrains the price level violates basic principles of economics. They say (1) is a "budget constraint" which must hold for any price path, and therefore can offer no constraint on allowable price paths. In fact, (1) is an equilibrium condition, not a budget constraint. Like any other supply = demand condition it only needs to hold in equilibrium, and thus can determine equilibrium prices. It operates just like the standard asset-pricing equation for valuing a stock as the present value of its dividend payments. The value of Microsoft shares depends on how many shares there are and the present value of future earnings. No "constraint" forces Microsoft to raise earnings in response to an "off-equilibrium" or "bubble" in its stock price.

The reason is subtle, and the confusion understandable. U.S. government debt is *nominal*, only a claim to U. S. currency. If debt is real, or denominated in foreign currency, then future surpluses must indeed adjust to pay off today's debt, or the debt must explicitly default. *Nominal* debt is like equity, and can partially "default" through inflation. The price level can jump to offset bad surplus news and therefore satisfy agents' transversality conditions.

At some point, every government must be "non-Ricardian." When it reaches the top of the Laffer curve, the government cannot raise the present value of surpluses, and a fiscal inflation must result. The fact that the government *must* be "non-Ricardian" at some point shows that it is *possible* to be "non-Ricardian" at others.

Sargent and Wallace

[3] Buiter (2002) is one prominent example. See Cochrane (2005) for a longer list of critics and discussion.

My analysis of (1) differs from Sargent and Wallace's (1982) and many other joint fiscal-monetary analyses in this crucial respect. In Sargent and Wallace, difficulties of government finance force the government to resort to seigniorage, i.e. an inflation tax, and that seigniorage causes inflation. Cagan-style inflation dynamics can then bring the future inflation back to the present. Sargent and Wallace's analysis works if the debt is real, and therefore (1) does act as a constraint.

By contrast, (1) works just as well if there is no money at all, or if money pays interest so there is no seigniorage. The mechanism by which future inflation is brought forward is direct, not relying on the interest-elasticity of money demand. It is the same mechanism by which bad news of future earnings results in a stock price decline today. We can see *current* inflation when people foresee a *future* monetization. The crucial distinction is that my form of (1) requires nominal government debt, while Sargent and Wallace's works for real or foreign currency debt.

3 Fall 2008, and "more of both"

Money demand

In Fall 2008, following the Lehman and Washington Mutual failures, the AIG bailout and secretary Paulson's TARP speech (in my and John Taylor's (2008) view, the event that triggered the credit crisis), monetary aggregates exploded. Deposits rose roughly \$600b, and excess reserves rose from \$6b to \$800b.

This event plausibly represents a huge increase in money demand, accommodated by the Federal Reserve, rather than an unprecedented attempt at hyperstimulation against a steady money-demand curve. Firms, unsure whether they would be able to get short-term financing in the future, wanted to convert every possible asset into cash. They also drew down lines of credit, often borrowing at relatively high rates in order to hold cash. (See Scharfstein and Ivashina 2009).

Focusing on $M_tV(\cdot) = P_tY_t$, accommodating a dramatic precautionary decline in V is necessary and laudable to avoid deflation. Friedman and Schwartz's classic criticism of the Federal Reserve during the Great Depression is that the Fed did not accommodate a dramatic rise in the demand for money, and so allowed an unnecessary 25% deflation. In the Great Depression people wanted to pull money out of banks and put them in cash, while in 2009 people wanted to put more money in bank and banks wanted to hold more reserves, but the same principle applies.

More of both; aggregate demand

However, conventional monetary policy only trades money for government debt. It can accommodate a demand for more money and *less* government debt. The events of last fall suggested a huge increase in demand for *both* money and government debt. All government bond interest rates declined sharply. Dramatic credit spreads opened. For example, high rated tax-free municipal bonds sold above treasuries. A large liquidity spread opened up between on-the-run and off-the-run government issues. The dollar rose, putting a dramatic

end to the "carry trade." These events suggest a "flight to quality" or "flight to liquidity" from private debt to U. S. debt of all maturities.

As one micro motivation for the flight, government bonds became practically the only security one could repo. In normal times, if you own a corporate bond, you can sell it in a repurchase agreement or use it as collateral for a loan, thus financing the bond purchase. In the Fall of 2008, suddenly only government bonds were acceptable as collateral. A government bond was as good as a dollar, because if you had a government bond, you could borrow a dollar.

Interest rates on government bonds fell to dramatic lows, including some negative rates. In combination with reserves paying interest, the *distinction* between government bonds and money (reserves) was a third-order issue for financial institutions, especially compared to the very high interest rates, lack of collateralizability, and dramatic illiquidity of any instrument that carried a whiff of credit risk. The credit spread rather than the level of rates or the term spread was the dominant factor in the interest rates faced by the private sector.

In short, financial institutions didn't want more money and less bonds. They wanted more of *both* money and government bonds, less of other assets, and in massive quantities. The "special" or "liquidity" services we usually associate with money applied with nearly equal force to all government debt to these actors.

Fall 2008 also corresponded to a sharp fall in "aggregate demand," as people and business cut back on both consumption and investment purchases in order to build up stocks of government debt. Again, crucially, the distinction between cash and government debt was second order in this desire.

$MV(\cdot) = PY$ does not really allow us to address this sort of event. We can understand it in terms of our fiscal equation however. A sudden demand for government debt, with no (good) news about surpluses, means that people are willing to hold that debt despite dramatically lower rates of return. In our fiscal framework

$$\frac{M_t + B_t}{P_t} = E_t \sum_{j=0}^{\infty} \frac{1}{R_{t,t+j}} s_{t+j},$$

a "flight to quality," or increase in demand for government debt with no change in expected surpluses, is equivalent to a sharp decline in the discount rate $R_{t,t+j}$ for government debt. Such a decline is deflationary, just as a sudden improvement in surpluses would be.

This observation is an inspiring event for the project of understanding longer-term U. S. experience through fiscal eyes. Fluctuations in "aggregate demand" are somewhat mysterious. By definition, they correspond to fluctuations in demand for government debt. Accounting for fluctuations in demand for government debt in U. S. history by changes in news of future surpluses has not been terribly successful. But accounting for the history of U. S. stock prices by changes in news about expected dividends has been an even more catastrophic failure. The asset pricing literature has concluded that time-varying discount rates account for essentially all stock market price fluctuations. This event suggests that we might similarly account for "aggregate demand" fluctuations by changes in the *discount rate* for government debt rather than (or as well as) changes in expectations of future sur-

pluses. People fly to quality quite generally in recessions. Perhaps this flight is the central part of lower "aggregate demand." If so, of course, it is completely missed by standard macroeconomic theorizing that focuses on "the" interest rate and ignores risk premiums.

Accommodation

The Treasury and Fed responded by accommodating the demand for government debt as well as accommodating the demand for money relative to bonds. The Treasury issued trillions of dollars of new debt. The Federal Reserve not only doubled the size of its balance sheet, but it exchanged practically all of its Treasury debt holdings for holdings of private debt. The government also guaranteed massive amounts of private debt, including Fannie and Freddie, guarantees of TARP bank credit, and guarantees of new securitized debt. The implicit guarantees of much larger amounts of debt – the widespread perception that no large financial institution will be allowed to fail – add to this list. To the extent that the private sector has a liquidity demand for debt with the government's credit rating, at the expense of debt which does not carry that guarantee, issuing such guarantees is the same thing as explicitly issuing Treasury debt in exchange for private debt.

In our fiscal framework, let D_t denote private debt owned by the government. Our fiscal equation becomes

$$\frac{M_t + B_t - D_t}{P_t} = E_t \sum_{j=0}^{\infty} \frac{1}{R_{t,t+j}(M+B)} s_{t+j} \tag{3}$$

where I have emphasized that the risk premium or liquidity premium R depends on the quantity of *government* debt only. Thus, by increasing the supply of Government debt, the discount rate R rises. Lowering the right hand side, this action is stimulative; it offsets the sharp decline in R that caused the decline in "aggregate demand" in the first place.

In this analysis, we can read the government's actions as a much modified version of Friedman and Schwartz's advice for the great depression. In that event, the Fed failed to accommodate a demand for money at the expense of government debt. In this one the government recognized and accommodated a massive demand for *both* money and government debt at the expense of private debt.

4 Fiscal and monetary stimulus

The government has, of course, gone far beyond "accommodating" shifts in demand for money and government debt, and is trying actively to "stimulate" the economy with fiscal and monetary policy. Will these work?

Fiscal stimulus

The government has also been engaged in a massive "fiscal stimulus" designed to raise "aggregate demand" with multi-trillion dollar deficits for as far as the eye can see. Will these

actually "stimulate" as promised? The fiscal valuation equation

$$\frac{M_{t-1} + B_{t-1}(t)}{P_t} = E_t \sum_{j=0}^{\infty} \frac{1}{R_{t,t+j}} s_{t+j}. \tag{4}$$

offers a standard view of this issue, with two important twists: If additional debt corresponds to expectations of higher future taxes or lower spending, it has no "stimulative" effect (for us, upward pressure on prices P_t). If larger short-term deficits (first few j) are financed by promising larger long-term surplus we again have no stimulative effect. If, however, additional debt and short-term deficits correspond to expectations that future surpluses will *not* be raised, then indeed the the debt issue can inflate, and hence (assuming that inflation has an output effect) "stimulate" the economy.

This sounds like fairly standard "Ricardian equivalence" analysis. However, standard Ricardian equivalence presumes that debt issue is *real* debt, so that some irrationality must be behind an expectation that the debt will not be paid off, or some market failure must exist for the fiscal action to have any effect. In the standard analysis, the right hand side of the fiscal equation, rationally anticipated, *cannot* fall below the left hand side. Here, we realize that the government issues *nominal* debt. It can be perfectly rational for long-lived agents to expect that the government does not plan to raise future surpluses, but that it plans instead to monetize the debt when the debt comes due. If you know debt will be inflated away in the future, you try to dump it today, causing inflation right away. And no market failure is necessary for that inflation to occur.

Will the spending come too late?

The Administration has been criticized that fiscal stimulus won't stimulate in time, because the spending will come "too late," after the recession is over. Equation (4) suggests the opposite conclusion. In order to get stimulus (inflation) now, *future* deficits (s_{t+j} for large j) are just as effective as current deficits (s_t, s_{t+1}). What matters is to communicate effectively how large the future deficits will be, and that they will be pursued regardless of the stock of debt. In fact, in this analysis, expected future deficits are even more important than current deficits. Large short-run deficits combined with the standard expectation that large short term deficits will be paid off by larger future surpluses have no "stimulative" effect.

Future deficits, current deficits, and expectations.

This analysis highlights the difficulty faced by a fiscal stimulus attempt. Government debt sales are deliberately set up to engender expectations that the debt *will* be paid off. Most of the time, governments do not sell debt to inflate; they sell debt to raise real resources that they can use for temporary expenditures. If a debt sale comes with no change in expected future surpluses, it only raises interest rates and raises no revenue, so governments are very careful to communicate that this is *not*the case. To see this point, consider the simple case with $M = 0$. Then the real revenue from the sale of debt $B_t(t+1)$ at time t is

$$\text{Real revenue } = \frac{Q_t^{(1)} B_t(t+1)}{P_t} = \left(m_{t+1} \frac{P_t}{P_{t+1}} \right) \frac{B_t(t+1)}{P_t} = E_t \left(\sum_{j=1}^{\infty} m_{t,t+j} s_{t+j} \right). \tag{5}$$

If expected surpluses do not change, real revenue is *independent* of the amount of debt sold – $B_t(t+1)$ does not enter in the final expression. Selling more debt $B_t(t+1)$ raises the price level P_{t+1} one for one, lowers bond prices one for one, and leads to no extra revenue.

As an extreme contrast, consider a currency reform in which the government redeems the old currency and issues new currency with three zeros missing. This operation is *exactly* a debt sale in which $B_t(t+1) = B_{t-1}(t)/1,000$. But a currency reform is designed to communicate expectations that real surpluses will not change precisely so that it will move the price level at $t+1$ and raise no real revenue. The *only* difference between a currency form and a debt rollover is that these expectations are communicated.

Since the institution of government debt sale is designed to convey the expectation that deficits will eventually be paid off, engendering the opposite expectations may be quite difficult. Everyone is used to fairly meaningless long-term budget projections.

Monetary + Fiscal policy; Japan

As we have seen, at the zero bound of nominal interest rates, and plausibly much before that point, monetary policy ceases to be effective at further "stimulation." Of course the Fed cannot lower interest rates further. The Fed can still buy Treasury and other debt and increase the money supply at a zero interest rate, a policy of "quantitative easing." However, although the Fed *can* increase M and decrease B, *nobody cares* if it does so. M and B are essentially perfect substitutes, so even larger open market operations will only mean an even larger decline in velocity or rise in the money multiplier.

What about a "helicopter drop?" A helicopter drop is at heart a *fiscal* operation. To implement a drop in the U. S. , the Treasury would borrow money, issuing more debt. It would "spend" the money as a government transfer. Then the Federal Reserve would buy the debt, so that the money supply was increased. Even a real drop of cash from real helicopters would be recorded as a transfer payment. Monetary policy is a rearrangement of government debt, more M, less B. An increase in government debt is a fiscal operation.

Our equations remind us that even a helicopter drop would not be "stimulative" if everyone knew that the money would soon be soaked up in higher taxes. Milton Friedman's colorful helicopter language brilliantly evokes a way of distributing cash that clearly sets up an expectation that this cash *does not* correspond to higher future surpluses to soak that cash back up. The only difference between a true helicopter drop and my financially-equivalent joint Fed-Treasury expansion operation is that the latter would most likely lead agents to believe the extra debt will, as usual, be paid off, and the extra money will, as usual, be soaked up, so it would have little stimulative effect. Literally dropping money from helicopters dramatically breaks the expectations that using familiar channels would evoke.

The last time these issues came up was monetary policy by Japan in the 1990s to escape its long period of stagnation, low inflation and near-zero interest rates. Money creation, quantitative easing, and huge fiscal deficits were all tried, and it still is puzzling that these measures did not lead to the intended inflation. Why not? The fiscal equation *holds*, so the answer *must* be that people were simply not convinced that the government would fail to pay off its debts. Breaking the expectation that debts will eventually be paid is not so easy

once that expectation is formed. (Likewise, forming that expectation once it is broken is not so easy either!).

In sum, what really matters is the expectation of future surpluses. If you can convince the public that these are lower than the real value of outstanding debt, including money, then you can get inflation. If you cannot, exchanges of money for debt have no effect, and increases in money or debt have no effect. If you can – perhaps by inventing a new institution such as helicopter drops – then you can stimulate inflation, but whether you drop money or debt from the helicopter makes no difference.

Identification

One implication of this analysis is that historical evaluation of fiscal multipliers suffers a deep identification problem. What were the expectations of people in previous events? If they expected inflation, i.e. that the debt would not be paid off, we should see stimulus. That experience would *not* inform us about the effects of a stimulus package that *did* come with a commitment not to inflate and therefore to raise subsequent taxes, or just an expectation of such a commitment. The usual arguments about Ricardian equivalence, which apply to real debt – market failure, liquidity constraints, or just plain lack of foresight – are perhaps more "structural," so estimates of past behavior are more likely to apply to the current situation. But expectations whether each debt event will be paid or inflated can vary arbitrarily with the circumstances of the event. Wars are plausibly quite different from recession-fighting stimulus packages, and stimulus packages come with different fiscal backgrounds. For example, Chile, with a large positive net asset position, is likely to face different expectations about long-run fiscal solvency of a stimulus plan than is the U. S., with a fairly large outstanding debt, and different expectations still than Italy or Greece, which already have high debt to GDP ratios.

4.1 What are expectations?

With this perspective in mind, will the current package stimulate – meaning, will it create inflation, and sooner rather than later? What *are* expectations of future surpluses and deficits.

Government announcements

On one hand, we can take the Government's deficit projections and their tax policy proposals as a loud announcement "you'd better spend the money now, because we're sure not raising taxes to soak it up." For example, the projections of the Congressional Budget Office (2009) send deficits on a downward trend that never recovers. Long term budget hawks have pointed to the unsustainability of Medicare and Social Security for a long time.

On the other hand, Chairman Bernanke and the other Federal Reserve Governors are also loudly saying the Fed can and will control inflation (though whether the Fed will be *able* to do so is another question). Chairman Bernanke's June 3 (2009b) testimony worries about long-term deficits, and thus whether the fiscal backing to *contain* rather than to

produce inflation will be present. Most of the Administration's defense of fiscal stimulus (For example Bernstein and Romer 2009) cites simple Keynesian flow multipliers, not the sort of fiscal-monetary inflation I have described as "stimulus." And by May, these simple positive multipliers turned in to a widespread worry about fiscal sustainability and can be read as dramatically negative multipliers. For example, the CEA's (2009) analysis of the Administration health proposal states that "slowing the growth rate of health care costs will prevent disastrous increases in the Federal budget deficit" and will raise the level of GDP by 8%, permanently. Secretary Geithner went out of his way to assure the Chinese that the dollar will not be inflated (Cha 2009).

In sum, government statements do not paint a clear picture. This may reflect an understandable indecision on the part of the government facing a Catch-22: In this analysis, the *only* way to "stimulate" is to commit forcefully and credibly to an unsustainable fiscal path, so that people will try to get rid of all their government debt including money, and in so doing drive up demand for goods, services, and real assets. But the government clearly understands that such an action trades modest stimulus today for financial and economic chaos when the inflation really comes. Faced with that stark decision, it is not surprising that the government settles for half-measures, wishful thinking and contradictory statements – as the Japanese were accused of doing for a decade.

Measuring Ricardian expectations

Fortunately, we don't have to argue about Ricardian or non-Ricardian expectations. The bond market and the fiscal equation let us *measure* private expectations. If the government sells additional debt and the private sector does not believe that debt will correspond to more taxes, then the government raises no revenue from the debt sale. It merely raises interest rates. Thus, *the revenue from additional debt sales and the behavior of interest rates allow us to* ***measure*** *the state of Ricardian-equivalence expectations.*

To see this result, recall that (5) showed that revenue from additional bond sales depends only on the increase in expected future surpluses that come with those sales. Selling debt when people do not expect larger surpluses means no revenue, and conversely the revenue that comes with bond sales measures the change in expected future surpluses. The real bond price is

$$\frac{Q_t^{(1)}}{P_t} = E_t\left(m_{t+1}\frac{1}{P_{t+1}}\right) = \frac{1}{B_t(t+1)}E_t\left(\sum_{j=1}^{\infty} m_{t,t+j}s_{t+j}\right)$$

This is simply the present value of surpluses divided by the number of "shares" into which that surplus is divided. Selling debt without a change in future surpluses just lowers bond prices. If, on the other hand, interest rates do not change, then we know that the larger debt corresponded to greater expected future surpluses.

(These expressions are a good deal more complicated with long term debt or money. In this case, unexpected sales of additional short term debt can raise revenue, because they devalue the existing long term debt. If \$10 billion of outstanding debt comes due next year, as claim to \$10 billion in surpluses, and the government unexpectedly sells \$10 billion more one-year debt today with no change in surpluses, it cuts in half the value of the outstanding

debt, and raises half that amount in revenue. Still, it is possible to infer the change in expected present value of future taxes from the revenue and interest rate impacts of debt sales, and again we can still apply the simple equations at a long-enough time interval.)

Alas, of course, economics is never easy because supply and demand both move. Some of the current rise in long-term rates may simply reflect a reversal of flight to quality and news of lower future surpluses (m, s news). Thus, it's not immediately easy to see how much extra "stimulus" bond sales are driving up nominal interest rates over what they would otherwise be. However, government interest rates are still quite low, so a good guess is that the massive deficits have not raised interest rates much. The government is certainly raising revenue from its bond sales.

In sum, the fact that bond markets are absorbing so much debt with surprisingly low interest rates is a direct *measure* that expectations are "Ricardian," so the stimulus is not yet having its desired (?) effect.

5 The inflation outlook

The Federal Reserve has issued at least a trillion dollars of extra money. When the time comes to reverse course, will the Fed be willing to do so? More troubling, will the Fed be *able* to do so, or will we discover the fiscal limits to monetary policy? Will mounting fiscal deficits instead force the Fed to monetize even more debt? Will we in fact see a fiscal inflation without current monetization, but based on a flight from the dollar, a fear of future monetization, as (1) describes?

Opinions are certainly mixed. Paul Krugman (2009) argues that "Deflation, not inflation, is the clear and present danger." Of course, Fed officials have given many comforting speeches on their "exit strategy." But Niall Ferguson (2009) Martin Feldstein (2009) and Anna Schwartz (Satow 2009) think inflation is on its way. Arthur Laffer (2009) thinks something like hyperinflation is on the way. Nonetheless, when I look at these opinions through the eyes of our fiscal (1) and monetary (2) equations, I see a surprising (though not perfect) consensus on the mechanisms and only a different assessment of the probabilities.

$MV = PY$

Some inflation hawks simply look at the vast amount of money, and infer that inflation must follow. Laffer says "The expansion of money, given an increase in the monetary base, is inevitable, and will ultimately result in higher inflation and interest rates." Some observers (not Laffer), I think are simply stuck in a view that $M_tV = P_tY_t$, velocity is stable, and that "long and variable lags" transmit money to inflation. This view is simplistic; I think we've all moved on to realize that velocity does shift, and that today's money need not mean tomorrow's inflation if the Fed soaks that money up fast enough.

Thus, inflation doves respond, what the Fed giveth, the Fed taketh away: the Fed can simply reverse course and sell a trillion dollars or so of treasury debt to soak up the extra cash. This argument is grounded in how $M_tV_t = P_tY_t$ works. In Laffer's view, $M1$ (monetary base plus checking accounts) or larger aggregates are the relevant M. Right now, most of the

increase in money is in the base (reserves). Laffer worries that banks will increase lending, expanding $M1$ by the same dramatic proportion. More importantly, Laffer worries that this process will be difficult to reverse. If the Fed then tries to soak up reserves, he thinks it will require a massive contraction in bank lending in order to reduce the relevant $M1$, which will require a sharp recession that the Fed will not be willing to countenance.

In the dove's view (Krugman), we are still in a "liquidity trap" so the extra reserves aren't going anywhere. I have argued above for this view of our current situation. Banks are just as happy to hold reserves as to hold government bonds; their lending activity is disconnected from their reserve holdings. Similarly, one can argue whether $M1$ is in fact the relevant aggregate. Finally, one can argue how difficult it will be for the Fed in fact to soak up what it has printed. Loans are redeposited in the banking system, so there is no connection between the amount of lending and the stock of any monetary aggregate. A cashless economy will have lots of loans.

Political will

A second worry, is whether the Fed will have the political will to start soaking up reserves quickly enough. Let us follow the likely scenario. The "credit crunch" is already over – short-term debt spreads have returned if not to normal, at least to functioning levels. The "financial crisis" is over – we have a "solvency worry" if anything. The "flight to quality" will soon follow. Investors will wonder, "why should I earn two percent in Treasuries when I can earn 6% - 10% in highly-rated municipal and corporate debt?" In trying to buy the latter, we will see long-term rates rise all on their own, with no change in short rates. In fact, as I write (June 2009) this reversal seems to be happening: Long term rates have risen about a percentage point in the last few weeks, despite no change in short rates, and with loud Fed statements that short rates will not rise in the forseeable future.

Now, while interest rates are rising and everyone else is selling Treasury bonds, the Fed has to sell another trillion or so to soak up extra money. It has to let short rates rise to meet the long rates. But we will still be in a serious recession. Many institutions will still be on the edge, including banks and other financial institutions tied to still-declining property values. And many of these institutions make a lot of money by borrowing low and short and lending long. Many Americans will still not have jobs. "Potential GDP" estimates will, as in the 1970s, suggest large "gaps." In this environment, can the Fed really have the will to engage in massive open-market operations, and start worrying about inflation? Will it be seduced by house and stock prices below their peaks in to thinking that "asset price deflation" counteracts good and services inflation? Furthermore, the Fed seems focused on "managing expectations" by announcements rather than direct open market operations in order to control inflation. Will it simply trust in that ability? It will not be easy.

The Fed's balance sheet

A third worry, echoed by Feldstein (2009), is that the Fed no longer has much Treasury debt. If it wants to soak up reserves, it may be very hard to sell all the illiquid, long-dated and risky private securities that the Fed has accumulated. Feldstein writes "..the commercial banks may not want to exchange their reserves for the mountain of private debt that the Fed

is holding and the Fed lacks enough Treasury bonds with which to conduct ordinary open market operations.."

However, there is nothing that stops the Fed and Treasury together from simply issuing new Treasury debt to soak up the trillion dollars or so of reserves, even if the Fed has nothing left on its balance sheet. They can do this, of course, *if* markets can be convinced that the value of the Fed's assets plus the Treasury's taxing capacity are sufficient to back that debt issue.

So we are back to the fiscal constraint (1). If bondholders can be convinced of future surpluses s, the liquidity of the Fed's balance sheet is irrelevant, as in the form (3).

This analysis reflects a long strain of experience in the fiscal backing of monetary policy. The only thing that matters is the government's ability to raise new debt, by credibly promising higher future surpluses. The size and composition of the central bank balance sheet does not matter. Central banks do not need reserves if the government can borrow them; conversely large reserves or even a currency board will not stem a currency collapse if the government's borrowing ability is gone.

Fiscal constraints

The more troubling question is, will the Fed be *able* to reverse course? At some point everyone else's desire to sell Treasuries is not just the unwinding of a liquidity/credit premium, it becomes a flight from the dollar – changing s expectations, a dramatic rise in R, not the reversal of a flight-to-quality in R. The Treasury will still be selling trillions of additional debt to finance huge deficits. Interest rates will go up on their own. If investors are also selling, can the Fed to sell trillions as well? How much interest rate rise will the Fed tolerate in its bond sales? When the unit-elastic point is reached, there is literally nothing the Fed can do to soak up money. Long before that, it is likely that the Fed will stop trying.

In reading the commenters, it is interesting how they (we) all *agree* on this mechanism, just disagreeing on its probability. Even Krugman admits "others claim that budget deficits will eventually force the U.S. government to inflate away its debt... [This claim] could be right but isn't" "Could be right" means that the view is logically possible; there is a fiscal limit. Krugman just doesn't think we're close enough to it to worry about it. In fact, Krugman goes on to point out the central fiscal channel I have emphasized in (1) rather than the conventional seigniorage channel: "[inflation hawks] say that America will eventually have to inflate away that debt — that is, drive up prices so that the real value of the debt is reduced. Such things have happened in the past. For example, France ultimately inflated away much of the debt it incurred while fighting World War I."

Who is right? Krugman points out that the U. S. debt/GDP ratio is below that of many other countries, and argues that current projections of debt/GDP of 100% or so are sustainable. I still worry: that ratio is increasing rapidly, and is full of risks. A few years of poor growth or having to make good on credit guarantees will raise it even more quickly, as I point out below. If the Fed's private asset purchases turn out not to be worth much, that will mean additional trillions that the Treasury has to borrow.

Where is the fiscal limit? I don't know. But there *is* a fiscal limit, and wherever it

is, we are three trillion dollars closer to it than we were last year, and we will be another three trillion dollars closer next year. We also know from past fiscally-induced currency collapses that the turning point comes suddenly and irretrievably, as do stock market collapses. Remember

$$\frac{M_t + B_t - D_t}{P_t} = E_t \sum_{j=0}^{\infty} \frac{1}{R_{t,t+j}} s_{t+j}.$$

When the combination of bad s news, bad D news and a higher R leads to flight from the currency, no rearranging of M for B makes the slightest difference (monetary policy). This event will come as a surprise to a Federal Reserve and to economists unused to thinking about fiscal limits to monetary policy.

In this debate, I have two points to add: Credit guarantees affect the calculation far beyond on-the-books debt to GDP ratios, and weak *growth* is the central danger.

5.1 Credit guarantees and the fiscal limit

If official debt to GDP ratios are "only" headed to 100% or so, credit guarantees are quite large. The government has explicitly guaranteed Fannie and Freddie debt and underlying mortgages, the TARP bank debt, and many others. Pittman and Ivry (2009) added guarantees up to 13 trillion, another 100% of GDP, though of course one can argue with their methodology and the chance that everything defaults with zero recovery is remote. Implicit guarantees are much larger. Fed Chairman Ben Bernanke[4] has pretty much guaranteed that no financial firm will fail, and bailouts of more industrial firms, state and local governments, defined-benefit pension plans, and sovereign debt either directly or via the IMF loom.

Credit guarantees have two effects. First, and most obviously, having to make good on these guarantees on top of large budget deficits can be the piece of poor surplus news that kicks us against the fiscal limit. Again, all we need is investors to *expect* large payouts in order to get an immediate flight from the dollar. Burnside, Eichenbaum and Rebelo (2001) argue convincingly that similar guarantees to banks were behind the essentially fiscal collapse of Asian currencies in 1997.

Second, nominal credit guarantees mean that government finances are much worse if the price level goes down, and much better if there is inflation. Higher nominal real estate prices in particular will make the government's guarantees much easier to maintain. Surpluses are *not* independent of the price level. Our equation is really

$$\frac{M_t + B_t}{P_t} = E_t \sum_{j=0}^{\infty} m_{t,t+j} s_{t+j}(P_{t+j})$$

with $s'(P) > 0$.

[4] See Bernanke (2009a), and in particular, "..government assistance to avoid the failures of major financial institutions has been necessary to avoid a further serious destabilization of the financial system, and our commitment to avoiding such a failure remains firm."

This consideration has a good and a bad implication. On the "good" side, this means that a smaller inflation can solve a larger budget problem. Since a rise in P makes the right side larger as well as the left side smaller, a lower rise in P is necessary than would otherwise be the case. (Good is in quotes, because I don't want to label what is basically a creditor default as an unequivocally good thing. It just means inflation will be lower than otherwise.)

On the bad side, this fact makes it much more likely that the government will choose inflation. One should not think of surpluses as exogenous in this fiscal analysis. They result from the Government's taxing and spending decisions, and raising taxes and lowering spending (particularly the latter) are physical possibilities, up to the Laffer limit at least. Really we should think of the Government's *decision* to inflate, trading off distorting taxes, useful or politically popular spending, and other considerations in this decision. $s'(P) > 0$ means that a smaller inflation can help to restore budget balance, but it also means that the government is more likely to choose that inflation rather than less pleasant measures, and measures for which it can be more directly held accountable.

5.2 The dynamic Laffer curve and the fiscal limit

One absolute fiscal limit is the point that higher taxation simply cannot raise any more revenue — the top of the "Laffer curve." At this point, any government must follow a "non-Ricardian regime" and the fiscal equation determines whatever is left of the price level. (Piergallini and Rodano 2009 model carefully the Laffer limit of fiscal theory.)

Since *present values* of future revenues matter, small effects of tax rates on growth can put us at the fiscal limit much sooner than static analysis suggests. Thus, a high marginal tax and interventionist policy which stunts growth can be particularly dangerous for setting off a fiscal inflation.

We are used to thinking of the static Laffer curve, in which tax revenue T_t is generated by a tax rate τ_t from income Y_t as

$$T_t(\tau_t) = \tau_t Y_t.$$

The marginal revenue generated from an increase in taxes is

$$\frac{\partial \log T_t}{\partial \log \tau_t} = 1 + \frac{\partial \log Y_t}{\partial \log \tau_t} < 1 \quad (< 0?)$$

The second term is negative – higher taxes lower output, so the elasticity of tax revenues with respect to tax rates is less than one. The top of the Laffer curve is where the elasticity is equal to zero, so higher tax rates raise no revenue.

Many economists think the U.S. is comfortably below that point. For example, a rise in the tax rate from $\tau = 0.30$ to $\tau = 0.35$ is a 15% ($\log(0.35/0.30) = 0.15$) increase, so it would have to result in a 15% decline in output before it generates no additional revenue. (Yes, this calculation is too simple, and the tax system is graduated. The point is to contrast this calculation with the dynamic calculation below, not to assess the U.S. tax system.) More people voiced concern that the UK's recent move to a 50% marginal rate plus VAT put it

above the top, especially since high-wealth people can leave. When tax rates are already high, the same percentage point tax rate rise is a smaller percentage (log) rise, so smaller output effects of each percentage point tax rise are necessary to offset the tax rate increase.

The *present value* of future tax revenues is what matters for the fiscal theory, however. For a simple calculation, suppose growth is steady at rate g (this is growth of total income, not growth of income per capita) and the interest rate is constant at r. Then, the present value of future tax revenues is

$$PV_t = \int_{s=0}^{\infty} \frac{1}{e^{rs}} \tau Y_s e^{gs} ds = \frac{\tau Y_t}{r-g}$$

Taking the same derivative,

$$\frac{\partial \log PV}{\partial \log \tau} = 1 + \frac{\partial \log Y}{\partial \log \tau} + \frac{1}{r-g} \frac{\partial g}{\partial \log \tau}$$

We see there is an additional term, which is also negative.

Since $r-g$ is a small number, small growth effects can have big effects on the fiscal limit. For example, if $r-g = 0.02$, then $\partial g / \partial \log \tau = -0.02$ puts you at the fiscal limit. Thus, if a rise in τ from 30% to 35% only has a $0.02 \times 0.15 = 0.003 = 0.3\%$ reduction in long term growth, then we're at the fiscal limit already, with no level effect at all.

I do not digress here to the economics by which marginal tax rates lower the level or growth rate of output. The disincentive effects of working, saving or investing are widely discussed. Migration of high-wealth people and businesses is perhaps even more important, especially to small countries: Even if growth per capita is not affected by distorting taxes, fewer capitas mean less tax revenue. Growth theory points to accumulation of knowledge as the main driver of long run per-capita growth rates, but I don't want to stop here to model how distorting taxes interfere with that process, nor tie the calculation to one particular such model.

6 Phillips curves–Will inflation "stimulate?"

The point of stimulus is not to inflate, of course, but to boost output in the short run. Many economists argue that a little inflation isn't such a bad thing in the current circumstance, as they argued for deliberate inflation in Japan in the 1990s. (For example, Greg Mankiw and Ken Rogoff are quoted in Miller (2009) as being in favor of inflation, both to bail out borrowers and on Phillips curve grounds to raise output.) I have not described a particular mechanism for output effects, in part because both the theory and experience of Phillips curves under fiscal inflations is unexplored territory. But I do want to point out that not all inflations come with output booms either in theory or in practical experience. There is no guarantee that inflation will "stimulate" the real economy. Inflation with real stagnation is a possibility too.

We have many precedents in traditional monetary analyses and historical experience. The 1970s had inflation with recession or stagnation. This experience is captured in two

ideas: "aggregate supply" shifted adversely, and inflation expectations rose or its "anchoring" disappeared, shifting the Phillips curve. Of course we all understand that currency reforms (exchanging old currency for new, with fewer zeros, or moving to the Euro) change the price level with no output effects at all.

Certainly, the history of fiscal inflations and currency collapses does not inspire hope that a fiscal inflation will result in prosperity. The hyperinflations that follow wars (Sargent 1992), as the current hyperinflation in Zimbabwe, were associated with horrible economic conditions, not the spectacular booms that a simple Phillips curve might predict. Currency collapses have a similar history. In fact, I cannot think of a single fiscal inflation that is associated with a boom.

In the fiscal context,

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

we can distinguish four kinds of inflation. There can be "inflation tomorrow" from issuing more money M_t or debt $B_t(t+1)$, without changes in surpluses. There can be shocks to prospective deficits s_{t+j}, causing a flight from debt, or a rise in the risk premium $R_{t,t+j}$. With long-term debt, sales of additional long-term debt also affect the price level.

It's not at all obvious from theory or experience that all of these inflationary channels would be accompanied by a boom or by the same boom. We have some sense that unexpectedly printing up a lot of money – a fiscal helicopter drop – might give a short-term output boost, especially if it were done as a surprise and with clear statements that the money would not be soaked up by taxes any time soon. However, the experience of fiscal inflations caused by current and prospective deficits – currency collapses – is not comforting.

As I look at our money and fiscal equations (1) and (2), and begin to think about how they work with less than frictionless markets, the fiscal equation (1) seems to provide the "anchoring" of inflation expectations necessary for successful monetary policy. In this way, a fiscal inflation could correspond to a "Phillips curve shift", or a loss of "anchoring" which would lead to inflation without expansion.

Fiscal inflations may also correspond to poor output through an "aggregate supply shift." Governments resort to horribly distorting taxes before they "default" through inflation.

The postwar U. S. experience arguably comes from a regime in which the fiscal constraint was not important. Our future may not be drawn from this same experience, and in particular may come from bad news about deficits. If that happens, we may find our comfortable experience of booms associated with inflations will vanish once again.

Here I part company with most of the inflation/deflation commenters. All of them link inflation always and everywhere to increased "demand" and hence tighter markets. Krugman (2009) writes "[in ordinary times]...banks, flush with reserves, would increase loans, which would drive up demand, which would push up prices." Laffer (2009) describes the same mechanism. Feldstein (2009) describes a more general "demand" based mechanism: "The key fact is that inflation rises when demand exceeds supply. A fiscal deficit raises demand when the government increases its purchase of goods and services or, by lowering taxes,

induces households to increase their spending..."

All of these analyses ignore the experience of the 1970s, in which inflation was high with little demand, and the experience of hyperinflation and currency collapse, in which inflation is astronomical with no demand whatsoever. The Phillips curve does shift, and a fiscal inflation may well correspond to a shift, not a movement along that curve.

7 Intellectual Casualties

As I have suggested, the current situation yields to an interesting analysis in which the fiscal valuation equation (1) takes center stage. It strikes me, however, that the current experience will leave two classic modes of analysis behind.

First, our old friend $MV = PY$ with constant velocity ("stable money demand") and long and variable lags seems a likely casualty. The Fed has pretty clearly accommodated a large shift in money demand. When that shift reverses, the Fed *can* (subject to a fiscal limit) reverse course and soak up that money. Simply looking at current aggregates is not a serious sign of future inflation.

Second, most monetary policy analysis has settled into the interest rate target doctrine of central banking. The Taylor rule by which interest rate targets will rise if inflation rises, and "managing expectations" of future inflation by unstated means are thought to be the key to controlling inflation. Of course, this analysis can only hope to work far from the fiscal limit. (Formal models are explicitly Ricardian with lump-sum taxes.) If a fiscal stagflation overcomes the U. S. , those who focus only on the standard doctrine will be puzzled at an inflation that seems to come from nowhere, just as many economists in the 1970s were puzzled that familiar relations were breaking down. Already, we see that most analysis is focused on the fiscal constraints on monetary policy or direct fiscal links rather than expectations about short-rate policy or simple open-market operations.

More generally, now that we see an event in which the *split* between federal funds and short term debt is essentially irrelevant compared to other events in the credit market, we may see that split as much less important in the future as well.

My analysis has been extremely simplistic of course. In places, the algebraic complexity of more realistic models didn't bring me more intuition, as with long-term debt. In many other places, we simply don't have well-tested theories on which to rely. One important item is to explicitly incorporate some sort of nominal rigidity along with a fiscal-dominant analysis, in such a way as to integrate the standard experience of the U. S. with small inflations, as well as the typical stagflation associated with fiscal currency collapses. My hunch that the fiscal equation provides the "anchoring" or lack of it for monetary policy is only a hunch.

8 Conclusion

The fiscal valuation equation

$$\frac{M_t + B_t}{P_t} = E_t \sum_{j=1}^{\infty} \frac{1}{R_{t,t+j}} (T_{t+j} - G_{t+j})$$

is clearly at the center of macroeconomic events right now, from stimulus, to monetary policy, to the inflation/deflation debate. As I boil it down, conventional monetary policy – the split between M and B – is essentially irrelevant for current macroeconomic events

Will we get inflation? I am not a forecaster, but I can outline scenarios. The "nightmare scenario" for inflation starts with growth much poorer than the administration's forecasts, possibly due to larger government distortions and higher tax rates. Lower growth is the single most important danger to the Federal budget. Then, the government may have to make good on its many credit guarantees, and continue its string of bailouts. If this happens, prospective deficit to GDP ratios will rise much further than current projections suggest. When investors see that path coming, they will quite suddenly bail out of the dollar; we will see a dramatic rise in interest rates, a fall of the dollar, and large inflation – and quite possibly "stagflation" not inflation associated with a boom. A rise in R – loss in the "quality" of the dollar – will combine with bad news about $T - G$ to make matters worse.

This is not a forecast. It need not happen. Whether it does depends on the actions of our public officials, which are very hard to forecast.

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