DOMESTIC CURRENCY DENOMINATED GOVERNMENT DEBT AS EQUITY IN THE PRIMARY SURPLUS

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ABSTRACT. Fiat debt is more closely analogous to privately issued equity than to privately issued debt, as it implies no promise to pay anything except future issues of government paper. This has implications for optimal fiscal policy and implies problems with the issue of large amounts of foreign-currency or indexed debt.

I. INTRODUCTION

The fiscal theory of the price level (FTPL) explains how the intertemporal budget constraint of a government that issues fiat-currency denominated debt[1] can be thought of as determining the price level. The reaction of many economists to this theory is that there are many dollar-denominated intertemporal budget constraints in the world, including those of, say, Orange County California, IBM, whatever FTPL economist is being argued with, and (hypothetically) a dollarized Mexico. Isn't it true that any one of these intertemporal budget constraints "determines" the price level the same way that of the US federal government does? And doesn't this suggest that the theory is fallacious, if it is interpreted as giving causal significance to the connection of fiscal policy to the price level?

This reaction is itself fallacious, but it is worth discussing it in some detail, not only as a general defense of FTPL, but also because the argument sheds light on some important policy issues. In the US, some economists have argued for increased use of indexed government debt, and in other countries recently some have argued for abandonment of the domestic currency in favor of the dollar, which would result in all government debt being dollar-denominated. While there are some valid arguments

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 Discussions with Darrell Duffie, Roger Farmer, George Hall, and Michael Woodford have sharpened my understanding of these issues.

[1]Or, in models without money, simply fiat-denominated debt.

in favor of these proposals, there are also strong arguments against them, based on analysis of their effects in intertemporal general equilibrium models, that are not widely appreciated.

Another policy issue related to these arguments is that of the fiscal foundations of the lender-of-last-resort function.[2] That this function, usually thought of as the domain of the central bank, has fiscal foundations, is also not widely appreciated. Understanding rests on seeing why the connection of the US federal government's budget constraint to the price level is different from that of other dollar-denominated intertemporal budget constraints.

A primary cost of eliminating fiat-denominated government debt is that thereby a route by which the fiscal system can efficiently share risk with holders of the debt is eliminated. The paper includes calculations that give a crude estimate of the order of magnitude of the amount of risk borne by holders of US debt since 1949. The amounts are neither huge nor trivial, and their timing suggests that the ability to share risk has at least to some extent been used efficiently by the US fiscal system.

II. Determining Price Levels via Intertemporal Budget Constraints: Yours, Mine, or the Federal Government's

I have a dollar-denominated intertemporal budget constraint, as does the US government. The simple intuition of FTPL is that, since the discounted present value of real future government primary surpluses must, by the intertemporal budget constraint, match the current real value of the debt, an expansion of the nominal debt unaccompanied by expectations of increased future primary surpluses will increase the price level so that intertemporal budget balance is maintained. Why is it reasonable to think this way about the US Federal government, while it obviously is not reasonable to argue that if I add to my debt without any intention of increasing my future stream of real payments of interest and principal, the price level will increase to produce balance in my intertemporal budget constraint?

The important difference between the US government and me is not our relative size or the fact that it is hard to sue the US government and not hard to sue me. The important difference is that when I issue "dollar-denominated" government debt I am making a promise to pay in units of a commodity (dollars) that I have a limited capacity to produce or obtain in the market, while the government is promising only to pay new paper that it issues at nearly zero cost. Even in a situation where I and my creditors both believe that I have earning capacity beyond my subsistence needs that I am willing to devote to debt service and repayment, I may be unable to borrow

[2]This issue is discussed also in Sims (1998)

additional funds, because creditors can see that my existing obligations exhaust my future capacity to pay.

The US government, on the other hand, can always make new dollar borrowings, so long as it has some prospect of generating a positive present value of future primary surpluses. The securities it issues promise only to pay dollars in the future. There is no sense in which existing dollar obligations of the government have priority, in real terms, over newly issued ones. Unless the government pursues a policy that makes the present value of future primary surpluses non-positive), newly issued debt will be worth something. If an unanticipated event makes it clear that there will not be enough future primary surpluses to sustain the current real value of the debt, the government does not lose the ability to borrow. Instead, the price level rises to make the real value of the future primary surpluses match the real value of the outstanding debt.

It may aid understanding to consider two cases in which a private entity can, in a certain sense, "control the price level" via its intertemporal budget constraint. One is the "too big to fail" syndrome. Very large banks or other private companies may be regarded as linchpins of the financial system, or be symbols of national pride, or employ so many workers as to make the prospect of their folding politically unpopular. The government may therefore find itself in the position of being committed to maintaining the value of a company's liabilities. Then the company (or some set of companies in a similar situation) in effect gains the ability to create and sell government liabilities. If the government does not have sufficient fiscal capacity to offset the company's drain on its finances, the company may indeed control the price level — by indirectly controlling the volume of outstanding nominal liabilities of the government. The usual assumption that private companies, when issuing debt, are promising to pay in units of a commodity they cannot create has broken down.

The second such situation would arise if a private company deliberately issued liabilities that made no fixed promise to pay, except in the form of new issues of the same sort of liability. I know of no companies that do precisely this, but many come close, at least over some span of time. Imagine that a company declares that its stock will no longer pay dividends, ever. Instead, the company will embark on a program of regularly buying back its stock in the open market, with the amounts of the buybacks varying over time with the fortunes of the company. Furthermore, to prevent the number of shares from steadily shrinking under this policy, the company will undertake a regular program of stock splits, with, say, all shares doubled (meaning each existing shareholder gets one additional new share) every five years. While no precise analog of such a stock exists, many companies do regularly buy back stock and many do issue no dividends over prolonged periods. It is widely understood that such

securities would have positive market value, and that the value of the outstanding stock would be the expected present value of the future buybacks, discounted at the market stochastic discount factor.

What does this thought experiment in equity pricing have to do with the price level? Our hypothetical company is almost perfectly analogous to a government that issues only 5-year bonds as liabilities (no high-powered money), with a fixed nominal interest rate of 15% per annum, while steadily running a fluctuating but positive primary surplus. The return on the company's equity in units of its own stock is fixed at 15%. If alternative investments pay less than 15% in real terms, and if the company's profits available for the repurchase program form a stationary stochastic process, then the company's policies will tend to dilute its stock over time, resulting in a decline in real share value. That is to say, the "price level", in units of this company's stock, will rise over time. In just the same way, a government that sets a high nominal interest rate, while maintaining a stationary but positive primary surplus, produces a determinate price level that tends to rise over time (at a rate roughly the difference between its nominal interest rate and the real rate of return on capital.)

Of course the consequences for the US economy of "inflation" or "deflation" in units of a private company's stock price are much less serious than the consequences of inflation or deflation in dollar units, because the dollar is the unit of account in many implicitly and explicitly intertemporal contracts other than government debt contracts. The point of the comparison to privately issued equity is only to make clear that there is indeed an analogy between private intertemporal budget constraints and the government's when we have both types of entity issuing similar securities — ones that make no promise to pay in units other than the security itself, and which therefore have value determined by expectations of the future resources that will be devoted to backing the security. It is therefore privately issued equity, not privately issued dollar debt, that is the closest analogue to publicly issued dollar-denominated debt.[3]

III. Implications, Limitations and Extensions of the Analogy between Unindexed Government Debt and Equity

The analogy between private equity and public nominal debt is limited by the fact that the objectives of the managers of private firms and of governments are usually not similar. For them to match, the government would have to be maximizing the surplus the tax system can generate to be applied to the personal benefit of those running the

[3]Cochrane (1999) has also developed the analogy between government nominal liabilities and stock

government, and the government would have to be securely in place, optimizing over a long time horizon. This seems plausible perhaps only for the case of certain types of colonial governments or stable personal dictatorships. Nonetheless, it may be useful to begin discussion for this case, as it makes the comparison less complicated.

Under what circumstances might a fiscal-surplus-maximizing dictator want to issue nominal debt, or instead issue only indexed or foreign-currency ("dollar") denominated debt? This is almost the same question as, "under what circumstances might a privately held firm want to go public, or instead remain privately held and use only debt finance?" Consider a proprietor who has risky investment opportunities that he thinks are likely to yield an above-market rate of return. Debt, if it can be issued at near-market rates, is attractive because it leaves more surplus for the proprietor than shares, which would require splitting the surplus with outside investors. Debt is also attractive because, if bankruptcy is a remote possibility, debt is likely not to require detailed scrutiny of operations by outside investors, and because it avoids the continuous market signal about the quality of management and investment prospects provided by a stock price. From the point of view of investors, debt is advantageous because (again assuming that bankruptcy is unlikely) it has low monitoring costs. But of course as the ratio of debt to firm value increases, bankruptcy risk increases. Required rates of return on debt will rise, and further loan finance may even become unavailable. Going public to raise additional equity capital may then be advantageous. By providing a larger capital cushion, it will increase borrowing capacity, and total returns to the original proprietors (if investment opportunities are good enough) will go up, despite their having to be shared with new investors.

If we translate these considerations into the context of the fiscal-surplus-maximizing dictator, it helps us see some important functions of nominal debt that might not otherwise be apparent. One is the function of nominal debt as absorber of fiscal risk. Paradoxically, the capacity of a government to borrow abroad in dollars could be enhanced by the presence of substantial outstanding nominal (i.e. domestic-currency-denominated) debt. The optimizing dictator will set taxes and expenditures to optimize the available fiscal surplus. The stream of revenue and expenditures is likely to be subject to unpredictable shocks — crop failures, disasters, wars, mineral discoveries, for example. If all debt is in dollars, these disturbances will enforce inefficient adjustment in fiscal parameters to maintain fiscal balance. If instead there is substantial nominal debt outstanding, the disturbances can be absorbed in the value of this debt, with no inefficient adjustment of fiscal parameters. In effect, stability of the real value of dollar debt is guaranteed by the instability of the value of the nominal debt.

This point that nominal debt efficiently absorbs fiscal risk is related to two earlier strands of research in public finance. One is Barro's[4] argument for tax-smoothing, which observes that it is likely to be best to avoid fluctuations in tax rates. The other is Judd's[5] emphasis on the fact that unanticipated capital taxation is not distorting, which implies that, were it feasible, it would be wise to absorb fiscal shocks in the rate of capital taxation. Taxation of private capital is difficult and expensive to administer, particularly if it fluctuates rapidly. The implicit tax on holdings of government debt that arises from unexpected shocks to fiscal balance, on the other hand, is automatic, with no administrative costs, and it is non-distorting for the same reason that unanticipated capital taxation is non-distorting. To the extent that shocks to fiscal balance can be absorbed by the implicit tax on nominal liabilities, rather than by fluctuations in the rates of distorting taxes or in expenditures, the result is likely to be increased efficiency.[6]

There is a second, political-economic, byproduct of the existence of nominal government debt. The existence of this debt, and the potential for its value to fluctuate with fiscal and monetary policy, creates an interest group very concerned with the fiscal condition of the country. When all debt is in dollars (or in the US, indexed), debt-holders need only keep track of the probability of default. When there is nominal debt and unpredictable movement in inflation and interest rates, every change in fiscal (and monetary) policy is of concern to bondholders, and financial markets will respond sensitively to the current and prospective changes in policy and in the efficiency of its administration. The existence of nominal debt therefore is likely to be associated with heightened public awareness of, and scrutiny of, monetary and fiscal policy. This is analogous to the greater public transparency of accounts at publicly traded private firms.

IV. A Simple Model of Debt as Shock Absorber

It may be worthwhile to show explicitly how Barro's (Barro 1979) model extends to a situation where unanticipated inflation is recognized as a possibility and the primary surplus is uncertain.[7] Barro postulated a government minimizing the present value,

[4](Barro 1979)

[5](Bizer and Judd 1989), e.g.

[6]Milton Friedman (Friedman 1948) proposed letting the price level absorb fiscal shocks, though not for the same reasons as suggested here.

[7]Barro's paper in fact considered the effects of unanticipated inflation. However the paper did not recognize the possibility that surprise inflation could be an endogenous result of surprises in the time path of G. It considered only unanticipated changes in P unrelated to fiscal policy.

discounted at a fixed rate, of expected future tax-collection costs

$$E\left[\sum_{t=0}^{\infty}\beta^s\tau_t f\left(\frac{\tau_t}{Y_t}\right)\right] \tag{1}$$

subject to its budget constraint

$$\frac{B_t}{P_t} = R_{t-1}\frac{B_{t-1}}{P_t} + G_t - \tau_t \tag{2}$$

and the boundary condition (which is likely to emerge as an implication of optimizing private behavior) that $\beta^t B_t/P_t \to 0$. His conclusion was that in the case of perfect certainty and constant G and Y, taxes τ should be constant and the real value of debt maintained at its initial value, whatever that might be. If G is exogenously given and fluctuates deterministically, then he concluded that τ should still remain fixed, and debt allowed to fluctuate to absorb the fluctuations in G. When there is stochastic variation in G and Y, his model implies that a function of τ/Y should be a martingale — much as the marginal utility of consumption is implied to be a martingale in Hall's version of the permanent income hypothesis.

However, there is a simple policy configuration in which τ/Y can be held absolutely fixed despite stochastic variation in G. As has been shown in the recent literature on the fiscal theory of the price level[8], if monetary policy holds the nominal interest rate fixed, while fiscal policy commits to a fixed τ/Y, the price level will adjust to maintain balance between the real value of outstanding debt and the discounted present value of future $\tau - G$. In a deterministic case it is clearly optimal (where, as here and in Barro's paper, we ignore any real value for the transactions role of money) initially to move τ to exactly G and leave it there, producing an instantaneous complete devaluation of outstanding debt via an infinite price level. But when we face uncertain future shocks to the path of G, it no longer makes sense to instantly make government debt valueless. Instead, it makes sense to preserve the option of using future surprise inflations to insulate τ/Y from fluctuations in G.

To see exactly how this can occur, suppose that G fluctuates between two values, say 1 and 2. When $G = 1$, it has a probability of θ jumping up to 2 next period, and it has the same probability of jumping back down to 1 next period when $G = 2$. We follow Barro in assuming that the real rate of return is constant because consumption is constant, and for simplicity we maintain the assumption that Y is constant. We will look for (and find) an equilibrium in which the inflation rate s constant at $\pi_H = P_t/P_{t-1}$ when $G_t = G_{t-1} = 2$ and at π_L when $G_t = G_{t-1} = 1$. We also assume that the realized inflation rate is $P_t/P_{t-1} = J_H$ when $G_t = 1$ and $G_{t-1} = 2$ and J_L when $G_t = 2$ and $G_{t-1} = 1$.

[8](Cochrane 1999, Leeper 1991, Sims 1994, Woodford 1995)

Optimizing behavior then imposes the condition that the expected real return on bonds matches β^{-1}, i.e.

$$R^{-1} = \beta \left[\frac{\theta}{J_H} + \frac{1-\theta}{\pi_H} \right] = \beta \left[\frac{\theta}{J_L} + \frac{1-\theta}{\pi_L} \right] . \tag{3}$$

We will assume that τ is fixed. It must then be true that

$$\frac{B_t}{P_t} = b_t = E_t \left[\sum_{s=1}^{\infty} \beta^t (\tau - G_{t+s}) \right] , \tag{4}$$

i.e. that the real value of the debt is always the discounted present value of future real primary surpluses. Under our assumptions on G, the probability that $G_{t+s} = 1$ given that $G_t = 1$ is $(1 + (1-2\theta)^s)/2$. With this formula, we can calculate expected future levels of the primary surplus, arriving at, for the right hand side of (4),

$$\frac{\beta \cdot (\tau - 1.5)}{1-\beta} + \frac{.5\beta \cdot (1-2\theta)}{1-\beta \cdot (1-2\theta)} \tag{5}$$

for periods in which $G = 1$ and

$$\frac{\beta \cdot (\tau - 1.5)}{1-\beta} - \frac{.5\beta \cdot (1-2\theta)}{1-\beta \cdot (1-2\theta)} \tag{6}$$

for periods in which $G = 2$.

For existence of equilibrium with positive b, there is a minimum value of τ, given by (when $\theta < .5$, so G is persistent),

$$1.5 - \frac{(1-\beta)(1-2\theta)}{2(1-(1-2\theta)\beta)} . \tag{7}$$

Thus it is feasible for the government to be running primary deficits whenever $G_t = 2$, though the size of these is limited.

The closer is τ to its lower bound, the lower is the overall excess burden of taxation, but the higher is the amount of price fluctuation required to maintain equilibrium. Within this model we have not allowed for the fact that there might be uncertainty about the upper and lower bounds on G and that large price fluctuations might carry costs. But clearly setting τ so that debt retains some real value, then using the debt to absorb the surprises in G, produces a better outcome in this model than does Barro's original prescription of keeping τ_t equal to the discounted present value of real primary surpluses while prices remain constant.

Would an optimizing government, capable of making the credible commitments about future behavior required to maintain this stationary equilibrium, actually choose such an equilibrium? The answer is yes, to a close approximation. Such a government would, if G_t were 2 in the initial period, approximately repudiate all existing debt, by issuing large quantities of new debt while at the same time setting the

tax rate so that taxes are equal to the discounted present value of future government expenditures, plus interest on the debt being issued. Of course it is not possible to completely inflate away the value of outstanding debt without making the newly issued debt also worthless. But the ratio of newly issued debt to outstanding debt can be made arbitrarily high, allowing arbitrarily close approximation to full repudiation. The price level in the initial period is determined by the amount of nominal debt issued, as the real value of the debt will be the discounted present value of the uniquely determined tax level. Thereafter, optimal behavior of the government corresponds to the stationary equilibrium calculated above.

V. Some Estimates of the Amount of Fiscal Risk Borne by Holders of US Government Debt since 1949

In deciding how valuable the ability to shift fiscal risk to debt holders might be, it is worthwhile to calculate the size of historical unanticipated fluctuations in the real return on government debt. To this point, I have completed such calculations only for the US, and there only for 1950-89.[9] The unanticipated return is calculated as (for year t)

$$B(t) - B(t-1) - r(t-1)B(t-1) - \tau(t) - B(t-1)(\pi(t) - \hat{\pi}(t)) \,, \tag{8}$$

where

$$\begin{aligned} B(t) &= \text{Market value of outstanding debt at end of year } t \\ r(t) &= \text{One-year government bond interest rate at end of year } t \\ \tau(t) &= \text{Primary deficit during year } t \\ \pi(t) &= \text{inflation during year } t \\ \hat{\pi}(t) &= \begin{array}{l}\text{anticipated inflation during year } t, \text{ based on} \\ \text{monthly data through the end of the preceding year}\end{array} . \end{aligned}$$

The expected inflation rate is computed from a monthly Bayesian VAR using the 6-month commercial paper rate, the consumer price index, and industrial production. The primary deficit is computed, as it is by Hall and Sargent, by aggregating changes in outstanding government liabilities with given maturity dates.

While these calculations give a reasonable approximation to the unanticipated real return to government debt, not all of this unanticipated return is generated by shifts in fiscal and monetary policy. There could be unanticipated shifts in real interest rates generated by private sector disturbances, and these would change the value of

[9]For these calculations I have been greatly aided by the cooperation of Tom Sargent and George Hall, whose paper (Hall and Sargent 1997) contains very similar calculations, and by the research assistance of Tao Wu.

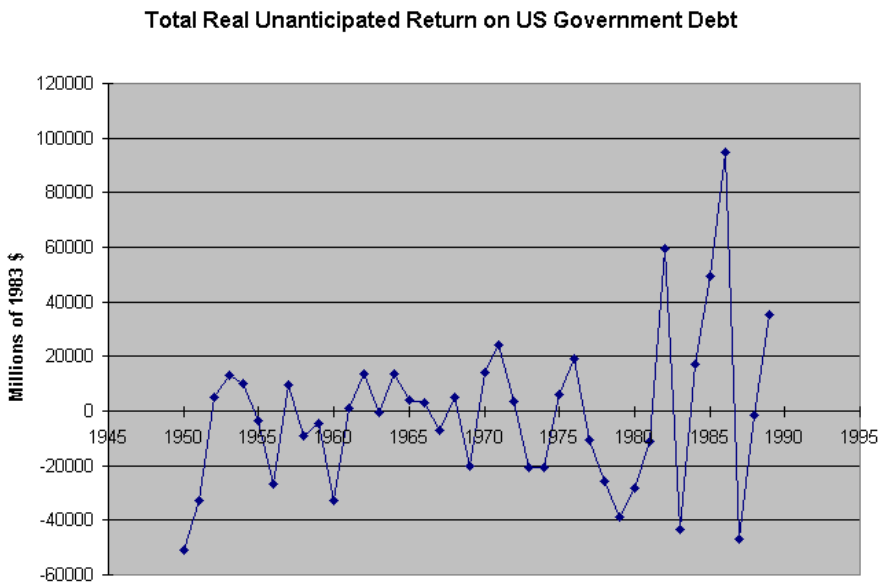

FIGURE 1

outstanding debt. But to the extent such real interest rate changes are small, these calculations may give a reasonable upper bound on the amount of unanticipated return variation imposed on debt holders by monetary and fiscal policy.

Figure 1 shows the results. This period had no disturbances of the magnitude of World War II or the Great Depression, but it does include the two oil crises of the 70's. We see that between 1973 and 1980 all but two years produced negative unanticipated returns, as would be expected of an optimizing government offsetting the negative fiscal shocks of the oil crises. The 80's then are dominated by positive unanticipated returns, as inflation is brought under control again. The amounts involved are not large relative to the Federal deficit — on the order of $40 billion as the maximum annual capital loss in the 70's. But they are not negligible either. And we should bear in mind that the capacity to absorb fiscal risk this way is likely to be most valuable in the extreme circumstances of war or natural or economic disaster, which did not occur in the US during this period.

It is interesting to note that the increasing amplitude of fluctuations in the total return is due in large part to the increasing scale of the real value of the outstanding debt. When we view them as percentages, as in Figure 2, we see that the growth in fluctuations is not as strong.

In thinking about the implications of a calculation like this for the policy question of whether to issue only indexed or dollar debt, it is important to assess whether the

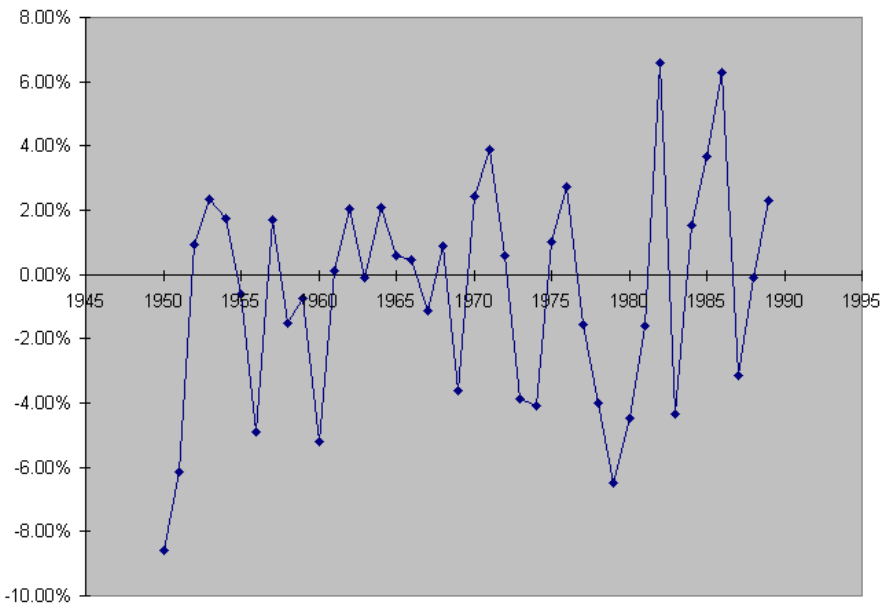

FIGURE 2. Percentage Unanticipated Real Return on US Debt

observed fluctuations have been due to erratic changes in monetary and fiscal policy that could easily and efficiently been eliminated, or whether they are instead due to stickiness of tax rates and expenditures in the face of real shocks. In the latter case, abandoning fiat debt would have implied more volatility in tax rates or expenditures, which is likely to have been inefficient. The pattern of negative unexpected returns in the 70's following the oil shocks suggests that at least some of the fluctuations are not erratic, but further research is needed to check this more carefully.

VI. Conclusion

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