cFEPS

edi
ECONOMIC
DEMOCRACY
INITIATIVE

Center for Full Employment and Price Stability
Research Archive

Interest Rates and Fiscal Sustainability

WP 53

Scott Fullwiler
Research Associate, CFEPS

Bard

Interest Rates and Fiscal Sustainability

by

Scott T. Fullwiler

Working Paper No. 53

July 2006

Interest Rates and Fiscal Sustainability

Scott T. Fullwiler*

Wartburg College and the Center for Full Employment and Price Stability

As baby boomers reach retirement age, concerns over the future path of federal spending on entitlement programs grows among orthodox economists. Researchers closely tied to the "generational accounting" literature (i.e., Kotlikoff, 1992) have been particularly prominent here. These economists have developed a measure that they call the "fiscal imbalance"—which they claim measures the magnitude of an existing unsustainable fiscal path. They argue that the fiscal path of the U.S. is $44 trillion off course compared to a "sustainable" path (Gokhale and Smetters, 2003a). Others within the circle have noted the $44 trillion "fiscal imbalance" in numerous opinion pieces (e.g., Gokhale and Smetters, 2003b; Kotlikoff and Sachs, 2003) and in other publications (e.g., Ferguson and Kotlikoff, 2003; Kotlikoff and Burns, 2004). An essentially identical measure expressing the imbalance as a percent of future GDP—the "fiscal gap" (e.g., Auerbach, 1994)—shows it to be about 7 percent (e.g., Auerbach et al., 2003).

The "fiscal imbalance" is calculated as the current national debt plus the present value of future expenditures *less* the present value of future revenues; future expenditures and revenues are estimated or predicted to the infinite horizon (Gokhale and Smetters, 2003a; Auerbach et al., 2003). The widely-cited 2003 study by Jagadeesh Gokhale and Kent Smetters was originally commissioned by then-Treasury Secretary Paul O'Neill in 2002, when its authors were deputy assistant secretary for economic policy at the Treasury (Smetters) and consultant to the Treasury (Gokhale), respectively. However, the Bush Administration played down the results of the report as it prepared in late 2002 and early 2003 to promote a second round of tax cuts (Despeignes, 2003). Nonetheless, measuring a "fiscal imbalance" via an identical methodology has since been promoted by others in the Office of Management and the Budget (2005), the Treasury (e.g., Fisher, 2003), the IMF (e.g., Mühleisen and Towe, 2004), and has also been incorporated into projections of the Trustees for Social Security and Medicare. A final example is worth particular mention: in November 2003, Democratic Senator Joseph Lieberman introduced the "Honest Government Accounting Act" that declared "the most appropriate way to assess Government finances is to calculate its net assets under current policies: the net present value of all prospective receipts minus the net present value of all prospective outlays and minus outstanding debt held by the public." The proposed Act specifically mentioned the study by Gokhale and Smetters and held it as an example of "honest government accounting." Had it been passed into law, the legislation would have created a "commission on long-term liabilities and commitments" to calculate the federal government's "fiscal imbalance" at 75-year and infinite horizons; had the "fiscal imbalance" been determined to exceed pre-set limits in any given year, the President would have been required to submit a plan for reducing the imbalance. In addition, all proposals for increased future spending or reductions in taxes would have been required to be "fiscally balanced" at 75-year and infinite horizons.[1]

* Email: scott.fullwiler@wartburg.edu

[1] In Congressional testimony in 2003, Smetters went a step further than even Senator Lieberman, proposing much the same as the latter's "Honest Government Accounting Act" but as an amendment to the U.S. Constitution.

These examples are the most recently influential applications of one of the core themes of orthodox macroeconomics: fiscal sustainability. Indeed, most will recognize that fiscal sustainability as presented in the fiscal imbalance literature is essentially an application of the orthodox concept of a government's intertemporal budget "constraint." Consequently, this paper is not as concerned about the particulars of the "fiscal imbalance" or related "generational accounting" literatures; nor, for that matter, does it deal directly with the supposedly looming financial "crises" facing Social Security or Medicare. Instead, the paper is most concerned with understanding and critiquing the assumptions or beliefs at the core of these literatures and measures, and then with providing an alternative view. Fiscal sustainability, when defined via an intertemporal budget "constraint" as the "fiscal imbalance" literature does, relies heavily upon assumptions regarding the relative rate of interest paid on the national debt. Several heterodox economists, particularly Post Keynesians such as Arestis and Sawyer (2003), have also noted this fact. This paper expands upon heterodox research in this area by referencing the actual operations of the Federal Reserve (hereafter, the Fed) and the Treasury as set out in their own research and regulatory publications and as consistent with their own balance sheet operations. In short, the orthodox concept of fiscal sustainability is flawed due to its assumption that a key variable—the interest rate paid on the national debt—is set in private financial markets as in the orthodox loanable funds framework. On the contrary, as a modern or sovereign money (Wray, 1998, 2003) system operating under flexible exchange rates, interest rates on the U.S. national debt are a matter of *political* economy (Fullwiler, 2005, 2006). This has significant implications for the appropriate "mix" of monetary and fiscal policies, particularly if full employment and financial stability are considered fundamental goals of macroeconomic policy.

Fiscal Sustainability: The Orthodox View

As mentioned, orthodox treatment of fiscal sustainability is understood by most already. It is nevertheless useful to discuss this in some detail in order to better understand how together the key assumptions frame the orthodox view of fiscal sustainability. This section begins by deriving the government budget "constraint," then turns to some of the most recent orthodox research on long-term interest rates. Next, the government's budget "constraint" and interest rate determination together set the government's intertemporal budget "constraint." Finally, recent concerns regarding additional, "nontraditional" effects of anticipated future deficits are reviewed. Also, throughout the section, the obvious consistencies with recent fiscal imbalance literature are noted and referenced.

1. The government's budget constraint and monetization

It is worth replicating Walsh's (2003, pp. 136-137) derivation of the government's budget constraint (hereafter, GBC) for a few reasons. First, the book is a standard text for graduate-level orthodox monetary economics courses. Second and third, this derivation of the GBC combines cash-flow identities of the Treasury and central bank into that of the "government sector," while an understanding of the interrelation of the operations of both is also central to the heterodox critique of the GBC presented below. Following Walsh (ibid.), the derivation begins with that he calls the "Treasury's portfolio constraint" (though, much like the GBC, it is in fact a simplified cash flow identity—somewhat analogous to a company's statement of cash flows—in the sense that it combines balance sheet and income statement identities). In (1) below, G denotes non-interest government spending, T is total tax revenue, iB^{Total} is the interest paid on the entire national debt outstanding, and ΔB^{Total} is the total increase/decrease in government bonds outstanding. Also, Walsh (ibid.) uses RCB to denote Treasury receipts from the central bank to the Treasury. All variables are for the current year.

$$(1) \qquad G + iB^{Total} = T + \Delta B^{Total} + RCB$$

Assuming that only a negligible portion of the central bank's interest receipts from the Treasury (iB^{Govt}) are not returned to the Treasury (the Fed is legally obligated to return any profits beyond its own imputed cost of capital), then

(2) $RCB = iB^{Govt}$.

Assuming that the change in the monetary base (ΔM) is created via open market operations that alter the central bank's bond portfolio (ΔB^{Govt}, though it is more precise to recognize that changes to *any* part of the central bank's balance sheet will alter the monetary base, *ceteris paribus*), then

(3) $\Delta B^{Govt} = \Delta M$.

Since the total government debt outstanding is equal to the portion held by the central bank as a result of open market operations and the portion held by the non-government sector (denoted as $B^{Non\text{-}Govt}$, for that portion not held by the central bank) such that $B^{Total} = B^{Non\text{-}Govt} + B^{Govt}$, substituting this into (1) yields

(4) $G + iB^{Govt} + iB^{Non-Govt} = T + \Delta B^{Govt} + \Delta B^{Non-Govt} + RCB$.

Substituting (2) and (3) into (4) then yields

(5) $G + iB^{Govt} + iB^{Non-Govt} = T + \Delta M + \Delta B^{Non-Govt} + iB^{Govt}$.

Finally, deleting iB^{Govt} from both sides of the equation and rearranging together result in the well-known GBC:

(6) $G + iB^{Non-Govt} = T + \Delta B^{Non-Govt} + \Delta M$.

The GBC thus states that non-interest government spending and interest on the national debt held by the non-government sector are equal to tax receipts, changes to the quantity of government bonds held by the non-government sector, and changes to the monetary base. The GBC is almost universally presented in academic literature and textbooks as demonstrating that government spending must be "financed" by either tax revenues or bond sales if monetization (i.e., "printing money") and the unleashing of inflationary pressures presumed to result from monetization are to be avoided. It is therefore quite well recognized within the GBC paradigm that a national government would not encounter a financial "constraint" the same way that a private business or household would, given its option to monetize via the central bank. Instead, the "constraint" in (1) is effectively that G should be chosen such that ΔM remains consistent with price stability (or at least a low, stable rate of inflation); that is, the GBC implies a "constraint" in as much as "printing money" to "finance" $G + iB$ is to be avoided. Thus, central to the orthodox view of the GBC is the belief that a deficit ($G + iB^{Non\text{-}Govt} > T$) that is "financed" via ΔM (i.e., ΔB^{Govt}) is significantly more inflationary than the case of "financing" via $\Delta B^{Non\text{-}Govt}$.

Finally, and not surprisingly, this belief is clearly at the core of the fiscal imbalance literature, as a few representative quotes demonstrate:

> If revenues are not sufficient to match spending, the government must meet the shortfall by printing money or by borrowing. Sustained reliance on printing money to finance deficits can lead to escalating price inflation, which can have debilitating consequences. (Auerbach et al., 2003, p. 110)

> The printing press is the time-honored last resort of governments that cannot pay their bills out of current tax revenue or new bond sales. It leads, of course, to inflation and, potentially, to hyperinflation. (Ferguson and Kotlikoff, 2003, p. 26)

2. Interest rates on government debt and the loanable funds market

That the government must, like any other institution within the economy, accept the terms of credit imposed by "market forces" as in the supply and demand for loanable funds framework is overwhelmingly—if not universally—accepted by orthodoxy. A recent brief from the Congressional Budget Office agreed that "by increasing the demand for credit, federal deficits tend to raise interest rates" (2005, p. 3). It is believed that ever larger deficits generate ever higher interest rates, as the

government must offer incentive to encourage private lenders to accept its IOUs in exchange for their saving or as a premium against the risk of default or—again, worse still—the possibility of future monetization to "repay" the deficits. The only caveat considered, of course, has been that "appropriately timed" deficits in the "short run" could enable increased private saving via increased national output, and thus no increase in interest rates would result (e.g., Bernheim, 1989). This well-known Keynesian/short run vs. neoclassical/long run dichotomy is viewed from the current "conventional view" (as labeled by Elmendorf and Mankiw, 1999) through the lens of temporary vs. permanent deficits. As such, there is widespread agreement with the claim by Rubin et al. (2004) that "*temporary* budget deficits can be beneficial by providing short-term macroeconomic stimulus when the economy is weak and has considerable unused resources of capital and labor. . . . Whatever decisions are made about short-run fiscal policy when the economy is weak, the objective should be budget balance over the business cycle" (p. 2; emphasis in original). Considering the business cycle in its entirety, or several business cycles strung together through time, it is presumed that labor and capital will be fully utilized on average, and thus a more *permanent* or *persistent* deficit will likely raise interest rates via a necessary reduction in national saving.

Gale and Orszag (2004) suggest that Ricardian equivalence and the small, open economy both fall outside of the scope of the "conventional view" since both approaches argue that deficits may not affect national saving or interest rates. However, both nonetheless presume a loanable funds market and thus argue that sovereign governments must accept the credit terms of private investors. Ricardian equivalence, as is well known, assumes that interest rates do not rise when there is a deficit since agents raise their saving in kind in anticipation of an increase in taxes later to offset the current deficit. The small, open economy view likewise argues that interest rates may not rise, in this case due to an influx of foreign saving; here, it is the terms of credit offered by global investors that matters, not just domestic investors. The U. S. Treasury has applied this open economy in providing its own view of how deficits incurred during the Bush Administration have not led to rising interest rates (United States Treasury, 2004). In February 2006, Treasury Secretary John Snow reiterated that "there is no doubt given the deep and liquid capital markets of the United States that we [i.e, the federal government] will continue to attract capital from investors around the world" (CNN Money, 2006).

From a loanable funds approach, "real economic forces" (i.e., saving, capital) set "real" interest rates, while nominal rates are set once expected inflation is accounted for (as in the Fisher effect). Orthodox research on the effects of deficits has generally utilized an approach in which real interest rates are set in a "steady state" equilibrium and depend upon the capital share of income and the income-to-capital ratio, which is consistent with a loanable funds market. As Engen and Hubbard (2004) explain, "A standard benchmark for understanding and calibrating the potential effect of changes in government debt on interest rates is a standard model based on an aggregate production function for the economy in which government debt replaces, or 'crowds out,' physical productive capital" (p. 4).[2]

Even as orthodox economists agree on this "standard" approach, there is some disagreement regarding whether the *stock* effects of a change in the debt-to-GDP ratio or the *flow* effects of a deficit-to-GDP ratio upon interest rates are most relevant. Elmendorf and Mankiw (1999) suggest that the presumed model of consumer behavior determines whether one should examine stock or flow effects upon interest rates. Engen and Hubbard (2004) derive theoretical effects on real interest rates of larger debt-to-GDP ratios from a Cobb-Douglas aggregate production function after assuming a capital-share of output of 1/3. Their analysis finds that a one percent increase in the U.S. *debt*-to-GDP ratio would raise real interest rates (as set by the marginal product of capital) by about three basis points. These results are consistent with those in Elmendorf and Mankiw (1999). Engen and Hubbard (2004) argue that this very

[2] A critique of the widespread practice among orthodox economists of deriving interest rates from the marginal efficiency of capital is beyond the scope of this paper. Galbraith (2005) presents one of the most recent critiques and relevant citations.

slight *stock* effect is the more relevant one since it is most consistent with standard orthodox models in which the real interest rate are determined by the level of the capital stock, while *flow* effect models such as the IS-LM approach are rarely used.

On the other hand, Gale and Orszag (2004) show, using a calibrated Solow growth model, that a sustained one percent increase in the *deficit* as a percent of GDP raises interest rates (assumed set by the marginal product of capital) by 40 to 73 basis points (pp. 120-122). They prefer reporting the *flow* effect of deficits since the hypothesized persistent one percent increase in the deficit will permanently raise the debt-to-GDP ratio by 10 to 20 percent (though the actual size of the increase will depend upon the original values of the debt-to-GDP ratio, deficit-to-GDP ratio, and growth rate of GDP). Applying a slightly altered version of their calibrated Solow model example to a Cobb-Douglas production function (the primary difference between the two is in the respective treatments of depreciation), they find that a persistent one percent rise in the deficit-to-GDP ratio raises the debt-to-GDP ratio over time to the extent that steady-state long-term real interest rates (again, as set by the marginal efficiency of capital) rise by 50 to 80 basis points (p. 123), which is a range similar to their above reported *flow* effects.

Of course, most obviously recognize that such theoretical results are less certain given that "other factors that influence interest rates are not constant" and that "changes in government debt are influenced by both exogenous and endogenous factors" (Engen and Hubbard, 2004, p. 9). Researchers then turn to empirical evidence. However, as Gale and Orszag (2004) report, "The effects of fiscal policy on interest rates have proved difficult to pin down statistically" (p. 147) since "previous analyses reach widely varying conclusions about the effects of deficits on interest rates" (Gale and Orszag, 2004, p. 147n). The Congressional Budget Office's review of the literature similarly notes that "overall [empirical studies] suggest that the effects of federal deficits on interest rates are small. Those studies have produced a wide range of estimates . . ." (2005, p. 4). Engen and Hubbard's (2004) summary (pp. 16-25) likewise confirms that "despite the volume of work, no universal consensus has emerged" (p. 16). In this vein, Gale and Orszag (2004) run numerous regressions of current (*ex ante*) real interest rates on current fiscal variables, but also find that "the fiscal variables are generally not statistically significant in these specifications, and they remain insignificant when the nominal rate is used" (p. 168). Similarly, Engen and Hubbard (2004) report effects that are not statistically significant (pp. 36-37).

These results are particularly surprising for orthodox economists given that the specification of the regressions and control variables therein are derived from the loanable funds framework, and they obviously find the results "hard to swallow" (Elmendorf and Mankiw, 1999). What redeems the loanable funds framework is the "realization" that "the studies that find no significant effect are disproportionately those that do not take expectations into account at all or do so only indirectly through a vector autoregression" (Gale and Orszag, 2004, p. 149). An influential paper by Feldstein (1986) argues, to the contrary, that in theory the effects of deficits on interest rates should depend upon how persistent the deficits are expected to be.

> Since financial markets are forward-looking, excluding expectations could bias the analysis toward finding no relationship between interest rates and deficits. . . . Over the past twenty years, many studies have incorporated more accurate information on expectations of *future* sustained deficits. These studies tend to find economically and statistically significant connections between anticipated deficits and current interest rates. . . . Of nineteen papers that incorporate timely information on projected deficits, thirteen find predominantly positive, significant effects between anticipated deficits and current interest rates, five find mixed effects, and only one finds no effects. . . . Thus, although the literature as a whole, taken at face value, generates mixed results, those analyses that focus on the effects of anticipated deficits tend to find a positive and significant impact on interest rates. (Gale and Orszag, 2004, pp. 148-149)

Nevertheless, much of the research incorporating expected deficits does not control for the widely assumed influence of the current business cycle on the current yield curve. Laubach (2003) therefore is an important initiator of the most recent series of research examining supposed effects of expected future

deficits. His approach uses average five-year-ahead deficit projections taken from both Congressional Budget Office and the Office of Management and Budget as the fiscal variable and then a five-year-ahead (i.e., forward) measure of the real long-term Treasury rate. Both would be expected to be less influenced by the current state of the business cycle. That projections of both agencies are frequently well off the mark is "irrelevant" according to Laubach (2003, p. 5). Rather, "The only relevant question is whether the agencies' projections accurately reflect market expectations at the time the projections were made" and that "arguably these agencies' projections are using most of the information about future deficits and debt available at the time" (ibid., p. 5). His regressions—consistent with the loanable funds framework—used an equity premium and projected potential GDP as control variables. His main conclusion was that a persistent one percent increase in the five-year ahead projected deficit-to-GDP ratio raised five-year ahead long-term Treasury rates by roughly 20 to 40 basis points (depending upon specifications); a one percent increase in the debt to GDP ratio was associated with a 4 to 5 basis point increase. Engen and Hubbard (2004) essentially duplicated Laubach's study but added oil prices, Federal Reserve security purchases, and a dummy for military buildup as control variables and found slightly smaller, though comparable effect of about 18 basis points; the effect of a one percent rise in the debt-to-GDP ratio was about 3 basis points.[3] Gale and Orszag (2004) duplicates Engen and Hubbard's regressions but adds constant and interactive dummy variables for recessions and uses defense spending as a share of GDP instead of a dummy variable for military buildups as additional control variables. Their results for deficits and debt are in the 25 to 38 basis point and 2 to 5 basis point ranges, respectively (again, depending upon specifications).

Particularly because the results from these three recent studies fall within a fairly narrow range and are arguably economically significant (18 to 38 basis points), they are now widely reported as the best empirical evidence that persistent government deficits raise real interest rates (e.g., Congressional Budget Office, 2005a; Mühleisen and Towe, 2004). The smaller debt ratio effects that Engen and Hubbard prefer to report are rarely mentioned as it appears most agree with Gale and Orszag's view regarding stock versus flow effects of sustained deficits. However, the results have been misreported by some, perhaps as a result of the complexity of the studies. For instance, after noting the difficulties empirical studies have traditionally had reliably quantifying the effects of deficits on interest rates, the Congressional Budget Office (2005a) reports that these recent studies have found "a sustained increase in the federal deficit amounting to 1 percent of GDP raises interest rates by roughly 20 to 60 basis points . . . with the weight of the evidence around 30 basis points" (p. 4). In fact, *none* of the studies found statistically significant effects of current deficits on current interest rates. What all three studies purport to find is that an expected deficit has an effect on a *forward* real interest rate; it is not necessarily clear what this means since the authors also presented mixed results regarding the effect of the same expected deficit on *current* real (or nominal) interest rates (into which forward rates are embedded).

3. The intertemporal government budget constraint

As in the previous two sections, the intertemporal government budget "constraint" (hereafter, IGBC) is known to many. Here, the derivation by Blanchard et al. (1990) is presented in discrete time since it is given in "percent of GDP" form and also because it is often cited or even duplicated in the fiscal imbalance literature (e.g., Auerbach, 1994). The IGBC's building blocks are the previous two sections: the GBC and the private credit markets' ability to set real interest rates on the national debt. Blanchard et al.'s (1990) derivation begins as follows: first, in the current year, the change in the nominal value of the debt held by the non government sector (here referred to simply as ΔB) is given by the

[3] As mentioned, Engen and Hubbard argued that modeling effects of deficits on interest rates, rather than changes in the debt, is inconsistent with a model of crowding out. They also argue that the strong correlation between the debt and the deficit is influencing the larger estimated effects of deficits.

current primary deficit ($G - T$) plus interest on the outstanding nominal debt held by the non-government sector (referred to here simply as iB), as in equation (2):

$$\Delta B = G - T + iB \tag{7}$$

Note that ΔM does not appear in Blanchard et al.'s (ibid.) equations, which is not uncommon. This is consistent with the primary assumption of the GBC that deficits "financed" via "money creation" (i.e., direct "borrowing" from the central bank) are inflationary, if not "hyper" inflationary. For the government's fiscal stance to be "sustainable" intertemporally, then, it is assumed that the path of future spending, taxation, and interest payments must, as in (7), avoid "debt monetization."

Lower case letters are used to rewrite (7) in real terms (i.e., inflation adjusted) and as percentages of real GDP, which aids in understanding the dynamic evolution of the GBC given in the IGBC. Thus, b denotes the ratio of debt to GDP; g and t are government non-interest spending and taxation as percentages of GDP, respectively; Θ is the real rate of growth of GDP; and r is the *ex post* real rate of interest on the national debt, as in equation (8):

$$\Delta b = g - t + (r - \Theta)b \tag{8}$$

In order to consider (8) intertemporally, the debt-to-GDP ratio prevailing n years from today, b_n, can be expressed as the debt-to-GDP ratio in the current year (expressed in this case and hereafter as b_0), compounded n years into the future plus the sum of the compounded value of primary deficits projected to be incurred hereafter as a percent of GDP. This is shown in (9):

$$b_n = b_0(1 + r - \Theta)^n + \sum_{k=0}^{n}\left[(g_k - t_k)(1 + r - \Theta)^{n-k}\right] \tag{9}$$

Discounting both sides of (9) to the present yields the following:

$$\frac{b_n}{(1 + r - \Theta)^n} = b_0 + \sum_{k=0}^{n}\frac{g_k - t_k}{(1 + r - \Theta)^k} \tag{10}$$

Equation (10) states that the present value of the debt-to-GDP ratio prevailing at some point in the future is equal to the current debt-to-GDP ratio plus the present discounted value of expected future primary deficits as a percent of GDP. As with the GBC, the GIBC as shown in (10) is simply an identity.

Like the GBC discussion above, for fiscal sustainability, orthodox interpretations of the IGBC impose an additional condition, which is that the present discounted value of the debt-to-GDP ratio tends toward zero as one considers ever larger values of n. In other words, b_n cannot be increasing faster than its discount factor; this is represented mathematically by taking the limit of the left-hand side of (10) as n approaches infinity:

$$\lim_{n\to\infty}\frac{b_n}{(1 + r - \Theta)^n} = 0\,. \tag{11}$$

Inserting (11) into (10) yields the following for large values of n:

$$0 = b_0 + \sum_{k=0}^{n}\frac{g_k - t_k}{(1 + r - \Theta)^k}\,. \tag{12}$$

Rearranging,

$$b_0 = \sum_{k=0}^{n}\frac{t_k - g_k}{(1 + r - \Theta)^k}\,. \tag{13}$$

Since b_0 is the current debt-to-GDP ratio, Blanchard et al. noted from (13) that "a sustainable fiscal policy can be defined as a policy [in which] the ratio of debt-to-[GDP] eventually converges back to its initial level, b_0" (ibid., p. 11). Thus, fiscal sustainability as defined here does *not* require that a government immediately or even eventually *eliminate* its debt. Note, however, that eventual convergence to b_0 *does* mean that "for a fiscal policy to be sustainable, a government which has debt outstanding must anticipate sooner or later to run primary surpluses . . . large enough to satisfy equation [13]" (ibid., p. 12); that is, the cumulative discounted present value of the expected future surpluses must be equal to the current national debt outstanding. "Barring that, the government would have to eventually repudiate its debt, either through straight repudiation or through the use of inflation" as set out in the GBC discussion above (ibid., p. 12).

The fiscal imbalance derived in Gokhale and Smetters (2003a) is based directly upon (11), (12), and (13) above, with $n = \infty$. For instance, they argue that "the government's fiscal policy may be considered balanced if today's publicly held debt plus the present value of projected non-interest spending is equal to the present value of projected government receipts" (ibid., p. 7); this statement—aside from its consideration of levels rather than percentages of GDP—simply rearranges (12) or (13) as in (14):

$$(14) \qquad b_0 + \sum_{k=0}^{n} \frac{g_k}{(1+r-\Theta)^k} = \sum_{k=0}^{n} \frac{t_k}{(1+r-\Theta)^k}.$$

The fiscal imbalance measure itself is simply equation (12) (again, $n = \infty$): "For the entire government's policy to be sustainable, its fiscal imbalance must be zero. The government cannot spend and owe more than it will receive as revenue in present value" (ibid., p. 8).

It is worth demonstrating numerically the implications of the above equations beginning with Gokhale and Smetters' (ibid.) assumptions that the initial national debt (B_0) is equal to \$5.137 trillion and initial real GDP is \$10.7 trillion, which yield a beginning debt-to-GDP ratio, b_0, of 48 percent.[4] They also assume a real interest rate of 3.6 percent. Table 1 shows implications for the path of fiscal variables in the fiscal sustainable case (i.e., fiscal imbalance=0, as in (11)) and in an unsustainable case (i.e., fiscal imbalance > 0, or right-hand side of (11) > 0). Implications for real GDP growth (Θ) at either 2 percent or 3 percent are both shown. Dollar values are shown in billions. As noted in the paper's introduction, Gokhale and Smetters (ibid.) calculated the fiscal imbalance to be \$44.214 trillion, so this serves as the unsustainable scenario in Table 1. In Table 1, for simplicity, it is assumed that the government runs the same size primary surplus/deficit as a percent of GDP in every year.[5]

The first row shows fiscal sustainability at Θ=3 percent. Here, the primary surplus is 0.28 percent each year; the cumulative present value of these surpluses into perpetuity is \$-5.137 trillion, which is equal to B_0,. As implied by (12) and (13) and as argued by Blanchard et al. (1990), this yields $b_0 = b_{30} = b_{75} = 48$ percent. Note that the government continues to run deficits (Δb) equal to 1.4 percent of GDP, and has interest payments equal to 1.68 percent of GDP. In other words, where $b_0 > 0$, the government can run *unified* deficits (i.e., inclusive of interest payments) indefinitely and still have a sustainable fiscal policy, as defined in (12) and (13), as long as it runs *primary* surpluses whose cumulative present value is

[4] Gokhale and Smetters (ibid.) erred in adding trust funds for entitlement programs to their measure of the existing national debt. While it is true that these represent a future liability of the government, the interest on them is not a government outlay but is rather an intergovernmental transfer. Even if this interest payment is "financed" by "borrowing" that further raises the size of the trust fund, this is likewise an intergovernmental transfer and does not affect the debt held by the non-government sector or the government's outlays to the non-governmental sector. However, the current exercise is merely to demonstrate the logic of fiscal sustainability using Gokhale and Smetters' well-known example, not to have precise real-world measures of the variables.

[5] This is different from Gokhale and Smetters (ibid.) since significant primary deficits related to entitlement programs are not expected for 15 to 30 more years, which weights more of their estimated \$44 trillion fiscal imbalance after 75 years than would be the case using the examples in Table 1.

equal to b_0. The third row of Table 1 shows the same scenario with $\Theta = 2$ percent, which is the rate assumed in Gokhale and Smetters (ibid.).[6] Here, primary surpluses must equal 0.75 percent of GDP each year in order for $b_0 = b_n = 48$ percent.

Rows 2 and 4 show implications of a fiscal imbalance equal to Gokhales and Smetters' (ibid.) estimate of $44.214 trillion; in this case primary deficits are 2.13 and 5.73 percent, respectively, the latter being very similar to the average of future primary deficits calculated in Gokhale and Smetters (ibid.) and in Auerbach et al. (2003). After 30 and 75 years, debt-to-GDP ratios rise to 126.7 and 273.6 percent in row 2, respectively, and to 293.9 and 962.6 percent in row 4, respectively. The interest as a percent of GDP column in Table 1 demonstrates what is "unsustainable" about these fiscal paths, since after 75 years interest payments have grown to 9.43 percent of GDP and 33.25 percent of GDP in rows 2 and 4, respectively. It is obviously the unlimited growth of interest payments that is at the heart of the unbounded rise in the debt-to-GDP ratio that violates (11).

More specifically, according to (7) or (8), rising interest payments require greater taxes, which are presumed to have a negative impact on economic growth, or greater borrowing, which—as in the previous section—is presumed to raise interest rates and thereby create further increases in interest payments while also slowing capital accumulation and growth (since greater government borrowing reduces national saving while both lower saving and higher interest rates reduce capital accumulation). The alternative is for governments to turn to "monetization" of these interest payments once they have become a significant percent of GDP. Such "monetization" enables debt creation without accompanying interest payments, but it also is presumed to result in greater inflation, if not hyperinflation. Thus, as noted above, where (12) is violated, eventually there is repudiation of the debt outright or indirect repudiation through inflation.

Kotlikoff and Burns (2004) thus argue that the fiscally imbalanced path is a road to ruin whatever choice is made:

> History is replete with examples of what happens when countries can't pay their bills. They raise taxes to exorbitant levels, default on their explicit or implicit obligations, and begin printing money like made. This triggers inflation, drives interest rates through the roof, and sends exchange rates down the tubes. Businesses go belly up, and banks shut their doors. The result is financial and economic meltdown. (p. *xvii*)

The solution according to them and others in the fiscal imbalance literature is for a forward looking measure that differentiates sustainable and imbalanced fiscal paths into perpetuity—as in the derivation above of (12) or, equivalently, (13)—to be employed that can guide governments into sustainable fiscal paths before such problems arise.

4. " Nontraditional" effects of government deficits on interest rates and the economy

While Table 1 provides examples of the eventual outcomes of unsustainable fiscal paths, orthodox economists go further still and once again invoke the loanable funds market in arguing that the negative effects should in fact occur much sooner than 75 or even 30 years. For example:

> Traditional analysis of [effects upon interest rates from] budget deficits in large advanced economies does not seriously entertain the possibility of explicit default, or of implicit default through high inflation. If market expectations regarding the avoidance of default were to change and investors had difficulty seeing how the policy process could avoid extreme measures [i.e.,

[6] Gokhale and Smetters (2003a) do not explicitly state their assumed growth rate of real GDP. However, given that real GDP begins in their study at $10.7 trillion and given a real interest rate of 3.6 percent, their assumed growth in real GDP can be determined from these since their stated estimate for the cumulative discounted value of real GDP at the infinite horizon is $682 trillion (2003b, p. 37). In other words, using the typical constant growth formula, (10.7 x 1.02) / (0.036 – 0.02) is equal to 682.

> default or inflationary "monetization"], the consequences could be much more sudden and severe than traditional estimates suggest. (Gale and Orszag, 2004, p. 115)
>
> The adverse consequences of sustained large budget deficits may well be far larger and occur more suddenly than traditional analysis suggests, however. Substantial deficits projected far into the future can cause a fundamental shift in market expectations and a related loss of confidence both at home and abroad. . . . This omission [by conventional analysis] is understandable and appropriate in the context of deficits that are small and temporary; it is increasingly untenable, however, in an environment with deficits that are large and permanent. (Rubin et al., 2004, p. 1)

In other words, once financial markets understand that a government's fiscal policy is on an unsustainable path, this should significantly raise the default risk or expected inflation premiums in government bond markets and thereby raise real interest rates significantly more than the "traditional" or "conventional" estimates of 18 to 38 basis points per percent of GDP increase in the deficit cited above.

Ferguson and Kotlikoff (2003) demonstrate that the fiscal imbalance literature is in complete agreement with this "nontraditional" view:

> Conventional wisdom predicts that if investors and traders in government bonds anticipate a growing imbalance in a government's fiscal policy, they will sell that government's bonds. There are good reasons for this. A widening gap between current revenues and expenditures is usually filled in two ways: first, by selling more bonds to the public, and second, by printing money. Either response leads to a decline in bond prices and a rise in interest rates: the incentive people need to purchase bonds. That incentive has to be larger when the real return of principal plus interest is threatened by default or inflation. (pp. 24-25)

Interestingly, all admit that there is no way of telling when such an abrupt change in market expectations will occur or precisely how the change will be triggered. But while "we can only guess what level of debt will trigger a shift in investor confidence," nevertheless, "If policymakers are prudent, they will not take the chance of learning" the precise tipping point (Ball and Mankiw, 1995, p. 117). Even Engen and Hubbard—who have disagreed with many orthodox economists by arguing that their own reported effects of increases in debt upon real interest rates (cited above) were not economically significant—concurred that their findings "should not be construed as implying that 'deficits don't matter.' Substantially larger, persistent, and unsustainable levels of government debt can eventually put increasing strains on the available domestic and foreign sources of loanable funds" (2004, p. 43).

Of substantial concern is that such a response from financial markets would further accelerate the negative impacts of the government's fiscal imbalance, since—for example—higher interest rates today would mean larger debt service on new and rolled-over debt today. The effects "can feed on each other to create a mutually reinforcing cycle; for example, increased interest rates and [the resulting] diminished economic activity may further worsen the imbalance [since deficits typically rise during downturns], which then can cause a further loss of confidence and potentially spark another round of negative feedback effects" (Rubin et al., 2004, p. 2). In short,

> Once these effects were in motion, [they] would substantially magnify the costs associated with any given underlying budget deficit and depress economic activity much more than conventional analysis would suggest. Indeed, the potential costs and fallout from such fiscal and financial disarray provide perhaps the strongest motivation for avoiding substantial, ongoing budget deficits. (ibid., p. 2)

The fiscal imbalance literature, not surprisingly, again concurred with these views:

> The process whereby current fiscal policy influences expectations about future inflation is a dynamic one with powerful feedback effects. If consumers in financial markets decide a country is broke and is going to inflate, they act in ways that actually catalyze such an outcome. By pushing up interest rates, they raise the cost of financing the government's debt and hence worsen its fiscal position. (Ferguson and Kotlikoff, 2003, p. 26)

In an op-ed to *The Financial Times* by Gokhale and Smetters even likened the *near-term* ability of the U.S. Treasury to issue bonds to the recent troubles of the California state government:

> California's bond rating has sunk to a level just above junk status—the lowest grade among all 50 states—as it struggles through its budget crisis. California is teaching the US a valuable lesson about the connection between fiscal policy and financial markets. Unfortunately, it may again be setting a trend for the nation: unless action is taken very soon to reform the main US benefit programmes, Washington may have to grapple with the same crisis currently preoccupying Sacramento. . . . Unresolved, the situation could cause US Treasury yields to rise sharply, wreaking havoc on the national economy. (2003b)

Thus, and to conclude this part of the paper, the orthodox position on fiscal sustainability holds that "monetization" is to be avoided since it is more inflationary than bond sales, while bond sales themselves are subject to interest rates set in loanable funds markets. A government's fiscal path is defined as unsustainable if the present value of future primary surpluses is not equal to the current level of the national debt. In that case, the debt-to-GDP ratio does not converge to its current level and grows without bound; most importantly, interest payments as a percent of GDP grow without bound, requiring the government to eventually choose between default or inflationary "monetization." Lastly, if financial markets recognize a given fiscal path is unsustainable, default premiums on government bonds would rise significantly as a result, which would then worsen the government's fiscal position and increase the likelihood that default or inflationary "monetization" would occur much sooner than previously anticipated.

Interest Rates and Deficits in a Modern Money Regime

Consistent with the previous section, Ferguson and Kotlikoff (2003, p. 25) argue that Treasury bond market traders could be expected to raise rates significantly given "unfunded" liabilities arising from Social Security and Medicare; they reasoned that rates had not risen because traders did not yet understand the implications of these liabilities. Three years have since passed with still little reaction from bond markets, while the "unfunded" liabilities have grown significantly from their already high levels. However, from the alternative perspective presented in this section, that interest rates have not responded in this way is unsurprising; instead Ferguson, Kotlikoff, and others relying on a loanable funds approach reminds one of Keynes's analogy of the Classical economists as "Euclidean geometers in a non-Euclidean world who, discovering that in experience straight lines apparently parallel often meet, rebuke the lines for not keeping straight" (1964, p. 16). Speaking most generally, the orthodox literature discussed in the previous section is based upon assumptions that could only be present in a fixed-exchange rate regime (Mitchell and Mosler 2005; Mosler, 1995; Wray, 2006a). Looking deeper, the orthodox conception of fiscal sustainability demonstrates a fundamentally flawed understanding of the interactions of the Fed, the Treasury, and private financial institutions within the U. S. financial system (Bell, 2000; Bell and Wray 2002-3; Fullwiler, 2003, 2005, 2006; Mitchell and Mosler, 2005; Mosler, 1995; Wray, 1998, 2003-4). This section discusses five different principles regarding interest rates and deficits in a modern or sovereign money regime (Wray, 1998, 2003) consistent with these real world interactions.

1. The Fed's operating target is necessarily an interest rate target

Orthodox economists now recognize that modern central banks target interest rates. As such, earlier debates about the appropriateness of interest rate or monetary aggregate targets appear to be settled at least for now. From the orthodox perspective, the variability and unpredictability of the velocity of money is an (unfortunate) fact of life in a modern financial system. Further, the framework provided by Taylor (1993) and now widely known simply as "Taylor's rule" helped allay the concerns of many regarding issues raised in Poole (1970) and by others about the shortcomings of interest rate rules in the

presence of non-monetary shocks to the economy. Still, there are many "true believers" who either anticipate the velocity of money's return to historical correlations with interest rates and nominal income, or who search for "more perfect" measures of monetary aggregates for central banks to target. Among the most enthusiastic in this regard is—not surprisingly—the St. Louis Fed, which regularly publishes "adjusted" measures of the monetary base (Anderson and Rasche, 1996; Anderson et al., 2003), Divisia monetary aggregates (Anderson and Buol, 2005; Barnett, 1980), and data related to "McCallum's rule" for a monetary base targeting regime (McCallum, 1988).

Heterodox economists—Post Keynesians and Circuitistes in particular—have to the contrary argued that the central bank has no choice but to set an interest rate target (see Fontana and Palacio-Vera (2004) for a recent and thorough discussion of the heterodox critique of the traditional orthodox "instruments and targets" approach). In practice, they have noted, central banks have always provided reserve balances at some price through open market operations or via overdraft/discounting facilities, either to avoid banking system collapse in times of crisis, or in more normal times to avoid a substantial increase in the overnight rate. In the U. S. case, even as the Fed attempted to achieve aggregate reserve and money targets during the 1979-1982 period, Meulendyke (1988) is clear that an interest-rate targeting procedure was in place at the operational or tactical level on a day-to-day basis. Her account essentially validated Moore's (1988) well-known critique of orthodox accounts of the period's interest-rate targeting tactics. More recently, Fullwiler (2003) and Lavoie (2005) have demonstrated that the central bank's obligation to promote the smooth operation of the payments system means that the provision of reserve balances are necessarily non-discretionary. In the U. S., for example, around $2 trillion in payments per business day are settled through bank reserve accounts, and a significant percentage of these payments themselves settle a larger amount of transactions that have been previously netted at various clearing institutions (Fullwiler, 2006, pp. 505-510). Payment settlement via reserve balances is facilitated by the Fed provision of an average of $30 billion in intraday credit *each minute* to banks and more than $100 billion in intraday credit during peak settlement times (Panigay Coleman, 2002, p. 76); in short, to not supply reserve balances at some price in the quantities necessary for banks to settle their payments is simply not an option since it would threaten the integrity of the nation's payments system.

Orthodox economists have long considered reserve requirements to be binding upon a bank's ability to create loans, and thus this ability to impose reserve requirements was presumed to enable money supply control. This view was at the heart of some of the provisions in the Monetary Control Act of 1980, which required all banks—even those not part of the Fed system—to be subject to the Fed's reserve requirements, and also required the Fed to set reserve requirements on other monetary aggregates such as time deposits. This "money multiplier" view is still prevalent in virtually every economics textbook from the principles level on up to the doctoral level. The main shortcoming of the money multiplier paradigm has been recognized for some time by Post Keynesians and Circuitistes: reserve balances simply are not an operational constraint on bank lending. The money multiplier approach presumes that banks need reserve balances to make loans, but reserve balances can only settle a bank's payments or aid the bank in meeting its reserve requirement. A loan, on the other hand, is created endogenously at the request of a creditworthy customer and creates its own deposit. As just one example, Moore (1988) notes that the substantial lines of credit banks pre-negotiate with their customers leaves the precise timing and size of their lending outside of their direct control. Again, as Moore explained, if loan creation or uncertain timing of deposit inflows has created an additional reserve requirement for a bank, the bank's response is to borrow the additional required balances in the money markets. Whereas the money multiplier presumes that reserve balances set the limit on a bank's lending or money creation, real-world banks instead and *necessarily* lend first and meet reserve requirements later.

At the aggregate level, were the Fed to supply too many or too few reserve balances in comparison to banks' reserve requirements, the result is a falling or rising federal funds rate (e.g., Mosler, 1995; Wray, 1998). Again, banks cannot "do" anything with reserve balances besides meet reserve requirements or settle payments. Further, as liabilities on the Fed's balance sheet, the aggregate quantity

of reserve balances circulating can only change as a result of an offsetting change somewhere else on the Fed's balance sheet; banks cannot affect the system-wide quantity through their own borrowing or lending actions with one another. If too many reserve balances are supplied, the federal funds rate is bid down as banks attempt to rid themselves of unremunerated, excess balances. If too few are supplied for banks to meet reserve requirements, then the rate is bid up as deficient banks attempt in vain to borrow excess balances from another bank, potentially without limit until the Fed itself steps in to supply the necessary balances necessary (which the Fed does at a penalty rate of one percent above the primary credit rate). Whether reserve requirement accounting is lagged or contemporaneous does not alter this process significantly. Indeed, the main effect of contemporaneous reserve accounting is increased uncertainty for both banks and the Open Market Desk regarding bank's balance requirements, which can result in increased variability in the federal funds rate at the end of the reserve maintenance period (Fullwiler, 2003; Moore, 1988; Wray, 1998).

Though economists have traditionally incorporated reserve requirements into nearly any analysis of the Fed's operations, such analysis more appropriately begins by considering these operations in the *absence* of reserve requirements (Fullwiler, 2003). In that case, banks use reserve balances only for settling payments with one another, clearinghouses, the Treasury, or the Fed; their demand for reserve balances is very interest inelastic and simply depends upon anticipated payment flows for the day. There is no point in the Fed supplying more or fewer reserve balances than banks need to settle these payments. Banks have no need for additional balances; recall that more reserve balances do not enable banks to make more loans. Similarly, fewer reserve balances circulating than banks need to settle payments would threaten the regular functioning of the payments system. Given a wide spread between the rate the Fed pays on balances banks hold in Fed accounts (zero percent) and the penalty rate assessed to bank borrowings from the Fed (currently one percent above the target rate, but previously the penalty for not repaying an overdraft from the Fed by the end of the day was the day's federal funds rate plus four percent), the actual federal funds rate could deviate substantially from its target if the Fed does not accurately estimate and accommodate bank reserve demand.

Reserve requirements, far from being central to the process, are simply one possible method of reducing variability in the federal funds rate. Substantial reserve requirements mean banks hold more than enough balances to settle payments and also generally enable banks to average balances held over several days; as such, if the quantity of reserve balances supplied is higher or lower than balances demanded, on most days the federal funds rate may not deviate substantially from the target rate. Still, though, reserve balances *only* settle payments or meet reserve requirements; reserve balances do not fund loan creation. Instead of reserve requirements, more direct control over the federal funds rate can be had by simply reducing the spread between the rate paid on balances held in Fed accounts and the penalty rate assessed to borrowings from the Fed. This has been repeatedly demonstrated in countries where central banks operate in the absence of reserve requirements. These central banks generally achieve very precise control over their interest rate targets—even as banks' demand for reserve balances is based solely on the substantially interest inelastic need for settlement balances—in part through a 50 basis point spread between the rate paid on reserve balances and the penalty rate for borrowing from the central bank, with the target rate set in the center of this spread.

As a brief aside, for many years numerous orthodox (e.g., as sweep accounts proliferated in the late 1990s) and heterodox (e.g., the Post Keynesian structuralists) researchers have argued that central banks might not be able to achieve their interest rate targets reliably or precisely. These arguments frequently considered as general cases the specific operating procedures that contributed to volatility. In fact, however, central banks can achieve a target as reliably or precisely as desired by simply narrowing the spread between the rate paid on reserve balances and the penalty rate on borrowings until the desired degree of precision is achieved. Other changes in operations, such as more frequent open market

operations or reduced penalties on overdrafts, can similarly enable more precise control.[7] While some of these options have been in conflict with other central bank or federal government goals (i.e., reducing government interest expenditures, reliably meeting reserve requirement needs of banks over the entire maintenance period, reducing payments system risk), some researchers have erroneously equated the choice (regulatory, legal, or otherwise) not to employ these methods with an *inability* to achieve precise control.

To review and then conclude this section, because banks can only use reserve balances to settle payments or meet reserve requirements, the Fed's provision of reserve balances is by necessity non-discretionary. If it were to do otherwise, the result would be wild swings in the federal funds rate that would create unnecessarily increased disorder and uncertainty in the money markets. Indeed, for the same reason, the Fed does not even add or subtract reserve balances when it announces changes to the target federal funds rate; rather, the quantity of reserve balances banks desire to hold for settlement and reserve requirements remains virtually unchanged for a given maintenance period even when the target rate is changed (Krieger, 2000). The money multiplier view of a Fed that raises or subtracts reserve balances to achieve control over monetary aggregates is thus untenable in practice. Similarly, the use of reserve aggregates as indicators of the stance of monetary policy—including "adjusted" measures of reserves or of the monetary base—misunderstands the actual nature of the Fed's operations as described in this section and as verified both in the Fed's own published annual reports on open market operations and in recent orthodox research on the subject (e.g., Clouse and Elmendorf, 1997; Demiralp and Farley, 2005; Furfine, 2000; Hilton, 2005; Woodford, 2001). Even if researchers someday were to find or devise a monetary aggregate (e.g., Divisia, adjusted measures of the monetary base, and so forth) worthy of targeting, the actual operating procedure for achieving such a target would necessarily begin with the Fed's interest rate target (though it is well known that interest rates are a particularly blunt—if not counterproductive—instrument for achieving monetary control). Again, this is all quite clear when one first considers monetary operations in the absence of reserve requirements, since it is then obvious that the only possible operating target is an interest rate target. In those countries without reserve requirements and in which reserve balances only settle payments, even in the absence of *any* reserve balances held overnight (e.g., Canada (see Lavoie, 2005)), money creation and lending continue much as in countries *with* reserve requirements. Where reserve requirements are absent, central banks—much like the Fed—do not adjust their target rates by changing the quantity of reserve balances in circulation; rather, these central banks simply announce the target rate change and also adjust accordingly both the rate paid on reserve balances and the penalty rate for borrowing (e.g., Guthrie and Wright, 2000; Woodford, 2001).

2. The federal government is not financially constrained

In a modern or sovereign money regime it is important to distinguish between operational or financial constraints and self-imposed legal or political constraints. As a fiat-currency-issuing, flexible-exchange-rate regime, the U. S. federal government faces no operational or financial constraints on its spending. Though the U. S. federal government might place legal constraints upon itself such as debt ceilings or prohibit the Fed from both providing overnight overdrafts to the Treasury's account and purchasing Treasuries in primary markets, these are self-imposed prohibitions of a currency-issuing government that can be and have been repeatedly sidestepped when it has been deemed desirable to do so. On the other hand, other entities that do not issue fiat currencies (households, business, state and local governments), or governments that fix their currencies' exchange rates to other currencies (as with the EMU nations or Argentina under the currency board) or commodities (as in a gold standard) *do* in fact

[7] A still simpler option, discussed below, is to set the target rate equal to the rate paid on reserve balances and leave substantial excess reserve balances circulating.

face financial constraints and in these cases the threat of default on debt obligations is in fact a legitimate concern.

Fiat money issuers such as the U. S. federal government spend simply by crediting bank accounts electronically. The Treasury's account, as a liability on the Fed's balance sheet, lies outside the definitions of reserve balances or the money supply. In effect, the government's spending creates money in the form of reserve balances and recipient deposits—since neither existed prior to the spending action—while the amount of the government's spending is debited from the Treasury's account (Bell, 2000; Mitchell and Mosler, 2005; Wray, 1998). More to the point, *whenever* the government spends, money is created; *whenever* the government receives tax payment, money is destroyed since payor deposits and bank reserve accounts are both debited in the process. This point is undeniable from a basic understanding of the balance sheets of the Fed and private banks, and is clearly laid out in the Fed's annual reports on open market operations and in other Fed publications. For example,

> The Treasury maintains its primary account for making and receiving payment, the Treasury general account (TGA), at the Reserve Banks. An increase in the balance of that account means that funds have moved from depository institutions' accounts at the [Reserve] Banks into the TGA. This movement of funds reduces the amount of reserves in the banking system. Conversely, a decrease in the TGA means that funds have moved from that account to depository institutions, thereby increasing the amount of reserves in the banking system. (DeCorleto and Trimble, 2004, p. 443)

Since the government's spending always creates its own government-issued fiat money, outside of self-imposed legal restrictions, there is no operational or financial constraint requiring that its spending be "prefunded" by cash on hand, income, asset sales, or debt issuance as other, non-currency issuing entities must do. Neither the electronic crediting of bank accounts while spending nor the electronic debiting of bank accounts when receiving tax payment or proceeds from bond sales reduce or raise respectively the federal government's operational ability to further spend by electronically crediting bank accounts (Mitchell and Mosler, 2005). The concern that the federal government might not be able to "pay its bills" is analogous to a concern that a scorekeeper at a football game might "run out of points" if too many touchdowns are scored (Forstater and Mosler, 2005). Instead, the ability to create money without regard to the size or timing of debits from or credits to the Treasury's account is precisely why self-imposed rules requiring that the government's spending during a certain period of time not exceed tax receipts by more than some specified amount can be and have been passed by or overlooked.

As a result it is also rather meaningless to consider anticipated liabilities of the federal government once they have been discounted to the present. Nevertheless, the proposed Honest Government Accounting Act presented the fiscal imbalance as a measure of "the amount that, if put aside today, would be just sufficient to cover the imbalance between . . . [anticipated] benefits and receipts." Similarly, the purpose behind the Treasury's commissioning of Gokhale and Smetters' report has been characterized in the following way: "Suppose the government could, today, get its hand on all the revenue it can expect to collect in the future, but had to use it, today, to pay off all its future expenditure commitments, including any debt service net of any asset income. Would the present value of the future revenues cover the present value of the future expenditures?" (Kotlikoff and Sachs, 2003). These statements miss a simple fact: because the government creates money whenever it spends—either now or in the future—there would be absolutely no point to "setting aside" its own money for future spending obligations. Discounting government revenues or spending from the future to the present suggests the government would earn interest on the money it "set aside" today, but just as revenues for bond sales or taxes do not affect the government's operational ability to spend, neither would any interest it would earn affect its ability to spend. Much the same logic applies to the Social Security or Medicare trust funds: neither of these actually provides the federal government with additional "financing" for future spending on these programs (Bell and Wray, 2000). Instead of "financing," both trust funds simply provide the respective programs with "legal ownership" of future allocations from the government's general budget.

Current laws that require the two programs be financially "balanced" according to particular methods of actuarial accounting have nothing to do with the ability of the federal government to spend in the future on these programs (ibid.).

The ability of a sovereign such as the U. S. federal government to create its own money is explicitly incorporated into the GBC as presented in equation (6) above, though it is frequently forgotten or glossed over, as when one refers to whether or not the government can "afford" certain spending programs or whether it will go "bankrupt" before it is able to meet all of its debt obligations. Still, however, the GBC presumes money creation is a "last resort" that is used only when a government cannot raise enough funds through taxation or borrowing. This misses the fundamental points that the *very act* of spending *is* the creation of money, while the act of receiving tax revenue *is* the destruction of money. Nevertheless, the fact that the U. S. federal government is not financially or operationally constrained does not by itself mean that the current and anticipated paths of spending and taxation are *sustainable* in the sense that the term has been defined by orthodox economists in IGBC equations (12), (13), and (14). A sustainable fiscal policy in that sense requires that even a government facing no operational or financial constraints meet its legally obligated commitments without engendering permanent increases in interest payments as a percent of GDP, which eventually result in spiraling inflation or the repudiation of sovereign-debt service in order to avoid spiraling inflation. Thus, sustainable fiscal policy is more about avoiding large-scale inflations resulting from rising debt service and less about the federal government's ability to create money. Whether or not a sovereign-currency-issuing government also has within its abilities the capacity to ensure fiscal sustainability depends to a large degree on how interest rates on sovereign debt are determined and on the macroeconomic effects of so-called "monetization," which are the subjects of the following sections.

3. Treasury bond sales are interest-rate support—not financing—operations

As explained previously, on a day-to-day basis the Fed has no choice but to accommodate banks' demand for reserve balances at the targeted federal funds rate, regardless of the method of reserve requirement accounting and regardless of whether monetary aggregates are of concern to policymakers. The daily process for accomplishing this is generally two-fold. First, the Fed estimates the reserve balances banks desire to hold; second, the Fed must offset anticipated changes in its own balance sheet, which themselves alter the quantity of reserve balances circulating. Due to this need to offset balance sheet changes, the Fed's daily operations have frequently been referred to as "defensive" in nature. The Fed's permanent operations primarily offset reserve balance drains due to banks' currency purchases via outright purchases of Treasuries. Shorter-term operations are generally repurchase (and, less frequently, reverse repurchase) operations in Treasuries that aim to offset changes in float, seasonal changes in currency, and changes in the Treasury's account balance, all while accommodating banks' aggregate demand for reserve balances at the targeted rate.

A quick review of annual reports on open market operations published by the New York Fed shows that changes to the Treasury's account have been often the most volatile and least certain of these in terms of the Open Market Desk's ability to predict daily changes in its balance sheet. This is not altogether surprising given that "the U. S. government is the largest transactor in the world" (Garbade et al., 2004, p. 1).

> During fiscal year 2003, aggregate federal receipts and expenditures averaged $18.8 billion daily. Money was disbursed to pay for purchases of goods and services, civilian and military salaries, transfer payments such as social security, and interest on the national debt. Receipts came primarily from personal and corporate income taxes and social security contributions. (ibid., p. 1)

As is already well established in several of the Fed's publications (e.g., DeCorleto and Trimble, 2004; Garbade et al., 2004; Lang, 1979; Lovett, 1978; Meulendyke, 1998), by orthodox economists (e.g., Hamilton, 1997), and by heterodox economists (e.g., Bell, 2000; Bell and Wray, 2002-3; Wray, 1998), the

Treasury maintains accounts at thousands of commercial banks—known as the Treasury Tax and Loan (hereafter, TT&L) system—in order to aid the Fed in offsetting day-to-day changes in the Treasury's account. In short, the Treasury transfers daily balances held in its Fed account beyond a certain target (usually $5 billion, though the target rises to $7 billion at the end of the month) into the TT&L accounts, and likewise calls in balances from TT&L accounts on days that its Fed account has dipped below this target. The implications for the Fed's daily operations are considerable:

> If the Treasury deposited all of its receipts in its Reserve Bank accounts as soon as the receipts came in, and if it held the funds in those accounts until they were disbursed, increases in its cash position would drain reserves from the banking system, and conversely, decreases would add reserves. . . . Treasury balances exhibit significant trends, building up when receipts exceed disbursements and running down when disbursements exceed receipts. Maintaining Treasury balances primarily at Federal Reserve Banks would therefore necessitate frequent and large-scale open market operations to mitigate undesirable fluctuations in bank reserves and the federal funds rate. (Garbade et al., p. 1)

The net effect of the TT&L system is greatly reduced end-of-day net changes in the Treasury's account, which thereby reduce net changes to total reserve balances circulating that the Fed would itself have to offset. During 1975-1978 the Treasury kept most of its balances in its Fed account instead of investing them in TT&L accounts. As expected and as literature published at the time confirms, this required much larger daily Fed operations to offset changes in the Treasury's account:

> This approach to managing the Treasury's balances increased defensive open market operations and complicated both the management of bank reserves and the short-run stabilization of the federal funds rate. (Lang, 1979, p. 6)

> Frequent and sizable System open market operations became necessary to offset the sharp fluctuations in bank reserves that would otherwise have resulted from the variations in Treasury balances at the Reserve Banks. (Lovett, 1978, p. 44)

The Treasury's return to utilizing TT&L accounts for cash management thereafter had an immediate effect:

> Since November 1978, when the Treasury changed its cash management procedures, the Federal Reserve has been faced with less uncertainty in managing the week-to-week volume of bank reserves.[8] Weekly swings in the Treasury's balance at Federal Reserve Banks have been smaller, and the decreased volatility of these balances has reduced the Federal Reserve's uncertainty about reserve positions. Consequently, Federal Reserve (Fed) open market operations that are conducted to offset the effects of fluctuations in Treasury balances on bank reserves have not had to be as large as in previous years. (Lang, 1979, p. 3)

Obviously, the purpose of the Treasury's actions through the TT&L system is for daily support of the Fed's interest rate target; absent the transfers to/from TT&L accounts, the Fed would be (and was) required to undertake the same operations itself in order to achieve its target rate. Note, however, that because—*ceteris paribus*—*all* government spending results in an increase in total reserve balance and taxes payments result in reserve account debits, on a larger scale Treasury bond sales provide much the same effect of support for the Fed's operations as the TT&L system does for shorter-term and smaller scale imbalances in flows to/from the Treasury's account. When a deficit is incurred, in order for the Fed's interest rate target to be achieved either the Fed or the Treasury *must* sell bonds in order to drain the net addition to reserve balances a deficit would create. If no bonds were sold, the deficit would generate a system-wide undesired excess reserve balance position for banks. Recall that banks can only use reserve balances to settle payments and meet reserve requirements; as banks with the excess positions attempted to lend these balances the federal funds rate would be bid down below its target.

[8] At the time, the reserve requirement maintenance period was one week in length. The increase to a two-week maintenance period occurred in 1984.

The same logic demonstrates why surpluses run by the Social Security and Medicare programs are not "saved," since such "saving" of surplus revenue results in a reserve drain (Bell and Wray, 2000). Instead, the surplus revenues received lead the Treasury to either sell fewer bonds when the general budget (i.e., the budget not including these entitlement programs) is in deficit or to retire additional bonds when the general budget is in surplus (as it did during 1998-2001). Widespread accusations from the media, politicians, and some economists that the Treasury has been "spending the surplus" revenue from these programs to "cover" a deficit position in the general budget misunderstand the effects of Treasury account flows on reserve balances and monetary operations. Selling bonds to "finance" the entire general budget deficit while "saving" surplus revenue generated by these programs would result in a net drain in reserve balances; the Fed would then be forced to buy bonds in the same dollar amount as the "saved" surplus revenue as a defensive offset in order to achieve its interest rate target. (This further demonstrates that the trust funds do not provide "financing" of future benefits, but—as explained previously—are instead "legal ownership" of future allocations from the general budget for these programs.)

Treasury bond sales have thus been referred to as "interest rate maintenance operations" rather than "financing" operations (Mitchell and Mosler, 2005; Mosler, 1995; Wray, 1998). More generally, bond sales are necessary because the federal funds rate target is above the rate paid to banks for balances held in their reserve accounts (currently zero percent in the U. S.). In this case, again, there is no choice but for the Fed or the Treasury to sell bonds when a deficit is incurred; to not sell bonds results in excess balances and the federal funds rate being bid below the target rate. However, and more precisely, a given deficit can be broken down into new reserve balances, additional currency in circulation, and new Treasuries held by the private sector. A change in currency in circulation is an endogenous variable driven by bank customers' demands for cash instead of bank liabilities. Reserve balances are, as previously explained, generally a non-discretionary variable for the Fed; if banks' reserve needs are greater than anticipated by the Fed on a given day, then some banks' reserve accounts necessarily go into temporary overdraft since the Fed leaves only enough balances circulating for banks to meet reserve requirements and payment needs. How much of a given deficit results in an increase in reserve balances under current operating procedures depends upon how much banks' demand for reserve balances has increased (which itself depends largely on the nature of reserve requirements), while the rest of the deficit must be offset by Treasury sales to the private sector if the deficit's reserve effects are to be offset and the interest rate target is to be achieved.

An alternative and far simpler approach to monetary operations is for the central bank to set the interest rate target at the rate paid to banks on reserve balances (Fullwiler, 2005, p. 547). While Post Keynesians and other heterodox economists have long argued that the Fed's provision of reserve balances is non-discretionary, here this is not necessarily the case as long as *at least* enough balances circulate for payment settlement and reserve requirements to be met. Since the overnight rate would not be bid below the rate paid on reserve balances, more balances in circulation than banks desire for these purposes does not reduce the rate, while an unanticipated increase in bank reserve needs would not send banks into overdraft if there is already a surplus in circulation. When a deficit is incurred in this case, there is no operational requirement that either the Fed or the Treasury sell bonds, since the net addition to reserve balances does not reduce the overnight rate. As Abba Lerner (1943) argued, bond sales can be undertaken simply because the private sector desires Treasuries for use as collateral or as default-risk free investments.

The most recent example of the approach in practice has been Japan during its zero interest rate targeting period, since the rate paid on reserve balances (zero percent) was equal to the interest rate target. In Japan, large fiscal deficits were held mostly as reserve balance by banks while the central bank held government bonds as an offset. While many have referred to this as "quantitative easing," note that because such "easing" resulted in large quantities of excess reserve balances the policy can only be employed if the interest rate target is equal to the rate paid on reserve balances.

Two separate proposals for setting the target rate equal to the rate paid on reserve balances have since been put forth in recent Fed publications. Under Richmond Fed President Jeffrey Lacker's proposal, the Fed would "sweep" reserve account balances at the end of the business day and invest them in reverse repurchase agreements in Treasuries held at the Fed, returning balances to reserve accounts at the start of business the next morning. As the "sweeps" proposal would be identical to interest payment on reserve balances, Lacker confirmed the analysis here regarding its impact upon monetary operations at the Fed:

> With a sweep service in place paying interest at the target rate, monetary operations could in principle be substantially simplified by supplying . . . more reserves than the banking system wishes to hold. No bank would lend overnight funds in the market at less than the rate on our sweep service. And a bank in need of borrowed funds could always find a willing lender at a risk-adjusted spread over the sweep rate. The market funds rate thus would not rise above the sweep rate, except to reflect borrower-specific risk. The New York Fed staff would merely need to . . . oversupply the system with reserves . . . . (Lacker, 2006, p. 9)

Whitesell's (2006) proposal is for banks to individually contract with the Fed to hold balances in reserve accounts; any balances held up to the contracted amount would earn interest at the target rate less a slight adjustment to reflect that deposits at the Fed are risk free, while balances held beyond the contracted amount would earn no interest. "In principle, policy implementation under such a system would not require a precise estimate of aggregate reserve demand on each day, as a broad range of aggregate reserve supplies would be consistent with a market interest rate close to the central bank's target" (Whitesell, 2006, p. 10). Both proposals further confirm that the quantity of reserve balances versus bonds circulating depends upon the method of interest rate maintenance employed by the Fed, since setting the target rate equal to the rate paid on reserve balances enables the Fed to provide an "oversupply" of reserve balances and fewer (than otherwise) Treasury securities are then held by the non-government sector.

The orthodox interpretation of the GBC presented previously in equation (6) presumes that a government will "monetize" its deficit if it cannot "borrow." However, the key point demonstrated here is that the GBC is misnamed since it is an *ex post identity*, not a "budget constraint" (Mitchell and Mosler, 2005; Wray 1998). This is consistent with the fact that a sovereign-currency-issuing government does not face a financial constraint, since a government that is not financially constrained implies that its bond sales are not financing operations, while their operational purpose is interest-rate maintenance. When a deficit is incurred, the additional quantity of bonds held by the non-government sector versus reserve balances created is unrelated to the "financing" versus "monetizing" decision hypothesized in the orthodox version of the GBC but instead depends upon the particular method of interest rate maintenance that is in effect (and, to a lesser degree, the nature of reserve requirements).

4. Monetization vs. bond sales is a false dichotomy

Preceding sections discussed the fact that, for a modern money regime, taxes and bond sales do not "finance" expenditures since spending occurs via electronic crediting of bank accounts while taxes and bond sales do the opposite. Bond sales are instead interest rate maintenance operations. One question still to be considered is whether with a given deficit more reserve balances in circulation and fewer bonds held by the private sector raise the likelihood of spiraling inflation, as the orthodox interpretation of the GBC assumes. The approach here recognizes the importance of understanding the balance sheet implications of both of these options (Wray, 2003-4). While orthodox economists typically assume a supply and demand relationship, as in the hypothesized loanable funds market, and then build models accordingly, such an approach can miss important relationships in the real world. In particular, *any* transaction in a capitalist economy results in changes in the agents' financial statements; if the hypothesized supply and demand relations are not consistent with the actual changes occurring within the financial statements of the relevant agents, then the hypothesized supply and demand model is irrelevant. This section demonstrates that, in a modern money regime, "monetization" versus "financing" as

characterized both in the GBC and in the orthodox view of the loanable funds market fall into this category.

Consider first the case in which the federal government runs a deficit but neither the Treasury nor the Fed sells bonds. This is "monetization" as described by orthodoxy in the GBC. Figure 1 shows the balance sheet effects of this in the private sector, with the effects on banks and non-banks shown separately. In this case, the government's net spending results in net credits to both bank reserve accounts and to deposits held by the non-bank sector (i.e., recipients of net government expenditures). But since current Fed operating procedures set the federal funds rate target above the rate paid on reserve balances, the quantity of reserve balances normally in circulation is necessarily very close to the quantity banks desire to settle payments and meet reserve requirements. The deficit in Figure 1 *will* create undesired excess balances and the federal funds target will be bid down—theoretically, to the rate paid on reserve balances—since banks themselves cannot change the aggregate quantity of reserve balances in circulation. Figure 1—or, "monetization"—is in fact *not an operational possibility* under current Fed procedures that set the target rate above the rate paid on reserve balances. In other words, even if the federal government wanted to "monetize" in the manner assumed by the GBC, either the Treasury or the Fed would still be required to sell bonds to hit the Fed's target rate, since this is the operational function of bond sales (Mitchell and Mosler, 2005; Mosler, 1997-8; Wray, 1998).

Before adding bond sales to the scenario, note that the GBC view of bond sales as less inflationary than "monetization" comes from the loanable funds market view of borrowing and lending, which suggests that government deficits reduce national saving and thus "crowd out" private-sector borrowing. As a brief digression, there are fundamental mistakes in this story that are already well known to heterodox economists. Most fundamentally, there is no "pool" of available savings that limits private-sector borrowing. Instead, the creation of a loan occurs endogenously without prior saving and unconstrained by reserve requirements; loans that finance private sector capital spending, for instance, simultaneously create saving in the national income accounts when the capital expenditure occurs. As Circuitistes have repeatedly demonstrated, within the private sector saving implies that investment spending has already occurred, much as (again, considering the private sector in isolation) the existence of a deposit or savings account balance implies that a loan has been booked (e.g., Lavoie, 1992). Combining business, household, and government saving together as "national saving"—as Gale and Orszag (2004) and many others do—similarly fails to recognize that the economy is a closed system in the sense that all cash flows across sectors net to zero. By definition, one sector's spending is another's income, while one sector's surplus of income relative to spending is another's deficit. In a closed economy (without international transactions), the private sector's net saving is equal to the government's deficit, and vice versa; in an open economy, the domestic private sector's net saving is equal to the government deficit plus the current account surplus (e.g., Godley, 1999). Thus, far from "crowding out" saving available to the non-government sector, basic accounting identities reveal that a government deficit *creates* net saving flows to the non-government sector.

The increased net saving in the non-government sector resulting from government deficits is readily seen in Figures 1, 2, and 3. By definition, additional net saving flows to a given sector are entered on a balance sheet as additional net financial assets for that sector. The creation of any financial asset generates both an asset and a liability; in the case of a government deficit, the liability remains on the government's balance sheet while there is a simultaneous increase in net equity or wealth in the non-government sector. In Figure 1, the new net financial assets are the additional deposits—the M1 measure of money—on the non-bank sector's balance sheet unaccompanied by an offsetting increase in its liabilities. Figure 2 shows the same deficit accompanied by a bond sale that is purchased by banks. In this case, the Treasury purchase by the banking sector is paid for by the debit to reserve accounts. The operational effect of the reserve balance drain is to support the interest rate target. There is still an increase in net financial assets or wealth of the non-government sector, as the deposits (M1) remain on the non-bank private sector's balance sheet. Figure 3 shows the same deficit accompanied by a bond sale to

the non-bank private sector, as in sales to non-bank Treasury dealers. As in Figure 2, the reserve drain enables the Fed to sustain the federal funds rate target, and there are again net financial assets created for the private sector in the form of Treasuries on the non-bank private sector's balance sheet.

In all three cases, money (broadly defined) is *created*, since deposits or M1 money is left circulating in Figures 1 and 2, while liquid Treasuries are circulating in Figure 3. In terms of the effect on net financial assets for the non-government sector, the figures show that there is no significant difference between "monetization" or bond sales besides the effects on the federal funds rate. But from the orthodox GBC view that "monetization" is more inflationary than bond sales, Figure 1 is assumed to be more inflationary than Figures 2 and 3. Regarding Figure 1, though, recall that banks have no reason to hold reserve balances aside from settling payments and meeting reserve requirements. While this forces the Fed to accommodate banks' demand for balances, more importantly here it also means that the reserve drain shown in Figures 2 or 3 can in no way restrict potential money creation by banks. Reserve balances do not "fund" loans or money creation; loans or money creation instead occurs when banks are presented with opportunities to lend at an expected profit.

Another implication, or (at least) interpretation, of the GBC view is that the Treasuries added to the non-bank private sector's net wealth in Figure 3 is less stimulative than the deposits created in Figure 1, but this is also clearly false. This ignores the fact that M1 money is left circulating when bonds are sold to banks, as well (as in Figure 2), so the distinction to be made in this case is actually between bond sales to the non-bank public and bond sales to banks (i.e., Figures 1 and 2 versus Figure 3) even though no orthodox economist has ever suggested that bond sales to banks were more inflationary than bond sales to the non-bank private sector. That the non-bank private sector is holding Treasuries rather than deposits in Figure 3 does not somehow constrain its spending; just as deposit holders could choose to convert its new wealth to time deposits instead of spending, so can the sector holding Treasuries (which are essentially time deposits at the Fed) choose instead to leverage its new wealth (which is highly valuable as loan collateral at any rate). Indeed, whether holding deposits or Treasuries, with greater net wealth and net income flows the non-government sector might logically be more likely to spend than without the deficit while also appearing more creditworthy to banks, who themselves face no operational constraint on money creation.

Finally, an overarching and important point of note is that the *Fed's* operations *do not* create net financial assets on the balance sheets of the non-government sector as orthodox fears of "monetization" seem to infer.[9] The quantity of net financial assets on the non-government sector's balance sheets is set by definition by the size of the government's total outstanding debt, not the Fed's operations. These net financial assets are held by the non-government sector as reserve balances, currency, or Treasuries. As discussed previously, the quantity of currency circulating is set by the non-government sector's preferences, while the relative quantity of Treasuries outstanding versus reserve balances is set by the method of interest-rate maintenance in place (and to a lesser degree by the quantity of reserve requirements). Instead of adding to or subtracting from the sum total of these three, the Fed's operations affect their *relative* quantities endogenously in response to the non-government sector's demands for currency and reserve balances within the context of both the current method of interest-rate maintenance and the current interest rate target. Even the Fed's lending operations, such as primary credit or intraday overdrafts, in addition to being endogenously created at the "request" of the non-government sector, do not add to the latter's net financial assets since these operations also create an identical quantity of liabilities that the non-government sector must service and either retire or rollover. By national income accounting and flow of funds identities, only a change in the government sector's debt can affect the non-government sector's net financial assets.

[9] The exception to this is float on the Fed's balance sheet, which in fact does create additional reserve balances for banks without an increase in accompanying liabilities for banks. The economic significance of this is minimal, however, generally totaling well below $1 billion compared to a total national debt of well over $4 trillion.

In sum, the orthodox GBC concern over whether or not a deficit is accompanied by bond sales is irrelevant for understanding the potential inflationary effects of the deficit. As demonstrated in the preceding section, the operational function of bond sales is to support the interest rate target, not to "finance" a deficit. A government bond sale does not somehow reduce funds available for non-government agents to borrow as presumed in the orthodox loanable funds market approach, while the absence of a bond sale does not somehow mean there is a greater amount of liquid financial assets, income, or "funds available" for borrowing. Instead, a government deficit always *adds* to the non-government sector's net financial wealth whether or not a bond sale occurs. Both the Treasury's bond sales and the Fed's operations affect only the relative quantities of securities, reserve balances, and currency held by the non-government sector; the total sum of these is set by the outstanding government debt. With or without bond sales, it is the non-government sector's decision to spend or save that matters in regard to the potential inflationary impact of a given government deficit. This helps to explain why very large deficits nearing 9 percent of GDP in Japan were not accompanied by substantial inflation or even substantial real GDP growth; while the balance sheet effects of the deficits essentially mirrored Figure 1 (due to "quantitative easing" and a zero interest rate target), Japan's private sector in fact desired to save *more* than this net increase in its nominal income (and more still than the further additions to net saving provided by the current account surplus). On the other hand, much smaller deficits as a percent of GDP in the U. S. (along with large current account *deficits*) have accompanied faster real GDP growth than in Japan—even as the balance sheet effects of the U. S. deficits essentially mirror Figure 3—because the U. S. private sector (households in particular) has been to this point willing to reduce its own net saving to an historically unprecedented degree (Wray, 2006b).

5. Interest rates on government debt are monetary phenomena

Given the real-world relations between banks, the Fed, and the Treasury as described in the preceding discussions—deficits do not crowd out but rather create net financial assets for the non-government sector; Treasury security sales are interest-rate maintenance operations rather than financing operations; the federal government faces no operational or financial constraints; and the Fed necessarily sets an interest rate target—then the orthodox accounts of the GBC and the effect of deficits upon "the supply of funds available" in the loanable funds market are inconsistent with these relations. It would seem to follow that the orthodox account of the interest rate effects of deficits are mistaken as they are also derived from the flawed loanable funds market paradigm. Recall also that it is the flawed loanable funds market paradigm that is central to the "nontraditional" effects of deficits discussed earlier, which renders the orthodox conclusions regarding interest rates and fiscal sustainability even further from the reality with respect to a modern money regime. Instead, it follows from the preceding points that the interest rate on the national debt in a modern money regime is a *monetary* phenomenon.

Consistent with the orthodox loanable funds approach, some have questioned the Fed's ability to influence other short-term rates. Widely cited articles by Friedman (1999, 2000) argued that the Fed needed financial market traders to essentially "go along" in order for its target to influence other short-term interest rates. More recently, and for different reasons, Thornton (2004, 2006) has even suggested that "most target changes are endogenous—the Fed adjusts its target whenever the equilibrium short-term rate changes" (2006, p. 24). Both Friedman and Thornton agreed that "it would take very large open market operations to defend a target rate that differed significantly from the equilibrium rate should market participants come to doubt the Fed's ability to defend its rate objective" (ibid., p. 24).

Such statements neglect a fundamental truth about the Fed's operations: because banks *need* reserve balances to settle large numbers of payments each day and to meet reserve requirements, the Fed's target rate influences other short-term rates through arbitrage, not vice versa. In other words, because banks *need* reserve balances, the interbank rate targeted by the Fed "matters" in the determination of other short-term rates even though the Fed makes no attempt to directly affect these other rates

(Fullwiler, 2006). This is confirmed empirically in numerous studies, such as those by Bartolini et al. (2005), Cyree et al. (2003), Demiralp et al. (2004), Griffiths and Winters (1997), and Lee (2003), all of whom find evidence of day-of-maintenance period and high payment flow day effects in overnight Eurodollar and/or repurchase agreement markets that mimic the well-documented and well-understood patterns of the federal funds rate (e.g., Clouse and Elmendorf, 1997; Demiralp and Farley, 2005; Furfine, 2000; Griffiths and Winters, 1995; Hamilton, 1996). Their research shows that arbitrage between these markets is *very* active up to the point that differences in default risk, collateral, and availability of offshore facilities come into play. Indeed, Demiralp et al found that arbitrage opportunities of only a few basis points are left unexhausted in these markets, while Bartolini et al. (2005) used high frequency, intraday data and found even smaller arbitrage opportunities remained. In short, there is no "equilibrium" short-term rate besides the rate targeted by the Fed; instead, it is the Fed's target that serves as the anchor for these other rates.[10]

Both orthodox (e.g., Friedman, 1999, 2000; King, 1999) and heterodox (e.g., Palley, 2001-2) researchers have suggested that banks' abilities to circumvent reserve requirements or utilize private payment settlement methods could eventually threaten the Fed's ability to influence other interest rates through its target rate. Again, however, this misunderstands the fundamentals of monetary operations. The *quantity* of reserve balances banks desire to hold in reserve accounts is irrelevant to the influence of a central bank's target over other rates (Fullwiler, 2006, pp. 508-510); in Canada, for instance, there are effectively *no* reserve balances circulating except on an intraday basis (Lavoie, 2005). What matters is simply that the demand for reserve balances be significant enough—in other words, *non-trivial*—such that the Fed's target "matters" for the determination of other short-term rates. Regardless of how reserve requirements or payments systems evolve in the future, that the non-government sector's tax liabilities are settled with the Treasury via banks' reserve accounts is sufficient for a *non-trivial* demand for reserve balances to exist (Fullwiler, 2006, pp. 515-521). Whereas neo-Chartalist research has demonstrated that a tax liability payable in the government's money creates a demand for this money (e.g., Wray, 1998), the corollary here is that a tax liability settled via reserve accounts held at the central bank is also sufficient for the central bank's interest rate target to serve as an anchor via arbitrage for other market interest rates.

Returning to federal government deficits and bond sales, an understanding of monetary operations is similarly necessary for understanding the implication for interest rates paid on the outstanding national debt. While the U. S. federal government issues debt across a broad spectrum of maturities, this is not necessary nor has it always been the case. The unnecessarily complex method of security issuance and wide array of maturities likely contributes to misinterpretations as in the loanable funds paradigm. An appropriate analogy is of Treasury securities as time deposits held by the non-government sector in Fed accounts, much as reserve balances are deposit balances held in Fed accounts (Mitchell and Mosler, 2005). The time deposit/demand deposit analogy is all the more relevant given that since the mid-1960s Treasuries exist only as balance sheet entries and change ownership only via the Fed's electronic transfer system (Garbade, 2004). The following paragraphs discuss four different methods for issuing debt under a modern money regime.

From the debt as demand deposit or time deposit analogy, the most general or simplest method of debt issuance would be for the non-government sector to hold no time deposits (Treasury securities) but instead to hold only reserve balances in reserve accounts (demand deposits at the Fed), as in Figure 1. Of course, this would eventually leave billions if not trillions of dollars in excess balances, and the federal funds rate would fall to zero, as many have pointed out (e.g., Bell and Wray, 2002-3; Forstater and Mosler, 2005; Fullwiler, 2005; Mosler 1995, 1997-8; Wray, 1998, 2003, 2003-4). Forstater and Mosler (2005) thereby declared that the most general or "natural" case is a federal funds rate of zero. Note that

[10] Furthermore, there is no reason for market participants "to doubt the Fed's ability to defend its rate objective," since the Fed clearly has no operational or financial constraint upon its ability to do so, like any sovereign-currency issuer. See Fullwiler (2006, p. 514) for a more complete discussion.

the nominal rate on the national debt would be zero in this case regardless how large the debt was, provided that it was greater than the quantity of balances needed by banks to settle payments (including settling customers' tax liabilities) and meet reserve requirements.

As previously noted, current monetary operating procedures achieve a positive federal funds rate target by leaving only as many balances in circulation as banks need to settle payments and meet reserve requirements. The "demand deposit only" option is possible with a positive interest rate target only where the target rate is equal to the rate banks earn on reserve balances. As the proposals from Lacker (2006) and Whitesell (2006) confirm, an operating procedure with interest payment and no bond sales in no way hinders the Fed's ability to carry out traditional monetary policy actions (i.e., set and adjust an overnight target rate) and actually *simplifies* Fed operations, since the Fed could simply announce changes to its interest rate target by raising or lowering the rate paid on reserve balances (Fullwiler, 2005, p. 547). This slightly less "general" or "natural" case of "demand deposits only" that earn interest would again leave the interest rate on the national debt equal to the Fed's short-term interest rate target regardless of the size of the debt or the deficit.

The Treasury's third option for debt operations is to issue short-term time deposits (i.e., Treasury bills), as in Figures 2 and 3. Just as with other short-term investments such as repos or Eurodollars, the rate on short-term Treasuries will not deviate significantly from the Fed's target without providing an arbitrage opportunity to investors, regardless how many are issued. As above, that taxes must be settled with reserve balances is sufficient for the Fed's target rate to act as an anchor for short-term interest rates including short-term Treasury rates. As with interest payment on reserve balances, the rate paid on the national debt in this case is thus determined primarily by the Fed's target rate, though the two will likely differ somewhat due to different maturities and default risk premiums. Note finally that even if the target rate were set at the rate paid on reserve balances as in the previous option, the Treasury could nonetheless issue short-term (or long-term, for that matter) securities in order for the non-bank, non-government sector to be able to hold default-risk free short-term investments that are also highly desirable as collateral.

Treasury notes and bonds—the fourth option for the Treasury's debt operations—are essentially fixed-rate, long-term time deposits held by the non-government sector; again, this is shown in Figures 2 and 3. It is well known that the rates on these instruments are primarily determined by current and expected future levels of short-term interest rates, though varying term and liquidity premiums can also be significant. FOMC Chair Bernanke recently reiterated this point while reciting the implied arbitrage relationship:

> All else being equal, if short-term rates are expected to be high on average over the relevant period, then longer-term yields will tend to be high as well. *Were that not the case, investors would profit by holding a sequence of short-term securities and declining to hold long-term bonds.* . . . Likewise, if future short-term rates are expected to be low on average, then long-term bond yields will tend to be low as well. (Bernanke, 2004, p. 3; emphasis added)

Of course, since the short-term rates themselves follow the Fed's target closely, this means that longer-term rates are based upon current and expected actions of the Fed. As with the other methods of debt issuance, the size of the national debt or deficit is irrelevant to the level of interest rates on these long-term, fixed-rate government issued time deposits except in as much as they influence the Fed's current or expected monetary policy stance.

Overall, any interest rate paid on the national debt is set by the stance of monetary policy whether it is held as demand deposits (i.e., Fed accounts) of the interest-bearing variety or short-term time deposits (Treasury bills), while the expected stance of monetary policy is significant when longer-term, fixed-rate time deposits (Treasury notes and bonds) are issued. As Bernanke and others recognize, for traders to try and set bid-ask rates on Treasury securities that deviate significantly from these principals, even amid the expectation of growing future deficits, would present an arbitrage opportunity for other traders to exploit.

Note that the monetary nature of Treasury rates also clarifies how long-term rates have remained stubbornly low (and even slightly declined) since the Fed's tightening cycle began in the summer of 2004, even as the phenomenon has been labeled a "conundrum" by most economists. St. Louis Fed President Poole verifies that long-term Treasury rates have been largely consistent with monetary policy expectations of traders as revealed in futures markets and the yield curve:

> The key to understanding this situation is that increases in the target funds rate were well predicted in June 2004, when the increases began from the unusually low federal funds rate of 1 percent. In June 2004, the market correctly gauged that the Fed would raise the funds rate steadily and gradually for the next year and a half. Not until the November 2005 FOMC meeting did the target funds rate exceed the rate that had been expected in June 2004. With the funds rate rising on the expected track, there was no reason for the 10-year bond rate to depart in any major way from its level in June 2004. The increase in the bond yield since November 2005 is consistent with the idea that the funds rate has now increased somewhat more than the market anticipated earlier. (Poole, 2006, p. 5)

Regarding Poole's comments about late 2005, note that it was then that the 10-year Treasury rate finally began to move significantly above 4.5 percent; Rudebusch et al. (2006, p. 2n) concurred with Poole that "the upward shifts in money market futures rates during 2005" indicate that continued policy tightening "appears to have been unanticipated" prior to that time.

Consistent with the loanable funds market paradigm, the most popular explanation for the "conundrum" among orthodox economists has been that large-scale foreign government purchases of Treasuries have kept long-term rates at lower than "equilibrium" levels. The view has remained popular despite the fact that such purchases are not occurring on the long end of the Treasury market in overly large amounts, as a recent San Francisco Fed publication confirmed:

> *Foreign governments' holdings are not concentrated in long-term Treasuries. As Chairman Greenspan (2004) pointed out, "...(foreign) central bank reserves are heavily concentrated in short-term maturities."* For instance, as of December 2004, foreign official institutions held $1.173 trillion in U.S. Treasury securities, with $245 billion, or 21%, in the form of Treasury bills whose maturities are less than one year. Moreover, the Treasury notes and bonds they bought in the past gradually mature (for instance, the 10-year Treasury bought nine years ago will mature next year), so the actual maturity of their Treasury portfolio is even shorter. . . . As of June 2003, over half of foreign central banks' holdings of Treasuries would mature in two years or less, and only 27% had an actual maturity of five years or longer by then. *In short, foreign central banks' U.S. Treasury portfolios are quite diversified and are not concentrated in long-term maturities.* (Wu, 2005, p. 2; emphasis added)

Indeed, historical correlations between long-term Treasury rates and foreign official purchases have generally shown a *positive* relation, indicating that—if anything—the causation is in fact reversed as higher Treasury rates attract greater foreign purchases (Wu, ibid.; Rudebusch et al., 2006). Rudebusch et al. (ibid.)—using *orthodox* models of the term structure—more recently concluded that this positive relation continued through 2005 and found "no [empirical] support for the view that foreign official purchases of U. S. Treasuries have contributed to the low level of long-term yields, even though this factor is regarded by many financial market participants to have been the single most important factor holding down long-term Treasury yields" (p. 5).

Of course, the foreign purchases "solution" to the "conundrum" more fundamentally neglects the arbitrage opportunities that would be created if long-term rates were significantly out of line with current and expected monetary policy actions (again, once the well-known maturity and liquidity premiums attached to longer-term securities are accounted for). As Wu (2005) put it, "Notice that a 40-basis-point discrepancy in 10-year Treasury yield implies a 4 [percent] bias in the bond price (assuming zero coupons), and foreign official purchases do not appear to be large enough to induce such a bias and sustain it" in the face of arbitrage by traders in very deep, liquid capital markets (p. 2). PIMCO Bonds' (the world's largest bond fund) Paul McCulley remarked similarly that "any market induced—foreign or

domestic-driven—upward pressure on U. S. intermediate or long-term interest rates would/will be limited by the leash of the Fed's . . . anchoring of the Fed funds rate . . . . Put differently, there is a limit to how steep the yield curve can get, if the Fed just says no—again and again!—to the tightening path implicit in a steep yield curve" (2003, p. 3).

Gokhale and Smetters' previously cited concern that the federal government could be faced with rising premiums on its debt as occurred in California mistakes a currency-issuing entity (i.e., the federal government) for a currency-using entity (i.e., state and local governments, households, firms, and so forth) within modern money regimes (Mitchell and Mosler, 2005). While Gokhale and Smetters, Gale and Orszag, and Rubin et al. (and many others) warn of inevitable surges in Treasury rates due to current and expected future deficits, they have been at a loss to explain the "conundrum" in long-term Treasuries given their anticipation of large future deficits. On the other hand, basic analysis of federal funds and Eurodollar futures markets or of implied forward rates from Treasury yield curves strongly supports the monetary nature of Treasury rates described here. Moreover, orthodox researchers' previously cited "evidence" that *expected* deficits raise forward real interest rates is highly questionable—beyond the more obvious deficiency of founding regression analyses upon aggregate production functions and the loanable funds market (Galbraith, 2005; also, see note 2)—since *none* of these studies controlled for the monetary policy *expectations* of traders that are clearly important determinants of forward rates even in orthodox models of the term structure (Rudebusch et al., 2006). In short, whatever the empirical effects of deficits upon interest rates that orthodox researchers do or do not find, if their analysis misrepresents the actual interactions between the Fed, the Treasury, and others in the financial system, then the analysis is disputable at best.

To conclude this section, in a modern money regime such as the U. S., deficits do not crowd out but rather create net financial assets for the non-government sector, the operational purpose of bond sales is interest-rate support, and the Fed's interest rate target anchors other short-term rates given that tax liabilities must be paid in reserve balances. As a result of these regime characteristics, the interest rate on the national debt is a monetary phenomenon that primarily reflects the current (and expected, if long-term, fixed-rate time deposits are issued) interest-rate "anchor" set by the Fed, not the size of the current or expected future levels of the debt or deficits as assumed in the loanable fund market paradigm. This monetary nature of interest on the national debt is indisputable when one considers that the federal government never *needs* to issue its debt as time deposits and could simply create (assuming a positive interest rate target) interest-bearing reserve balances that earn interest at the Fed's target interest rate, as in the proposals discussed earlier. Self-imposed constraints, including legal restrictions on operating procedures or lack of political will, might keep a simplified procedure such as this from being implemented, but they do not change the monetary nature of rates paid on the national debt; the choice to issue short-term or long-term securities (i.e., non-government sector time deposits at the Fed) is simply a more complicated version of this more general or (in the case of a zero interest rate target) "natural" case.

Sustainable Macroeconomic Policy in a Modern Money Regime

Both the orthodox GBC and the modern money analyses recognize the federal government's ability to create money and therefore can always service its own financial obligations; any default on obligations in its own money would be a choice, not a necessity, unlike default for a non-currency issuer. But, as previously mentioned, fiscal sustainability as defined by orthodoxy is not about the ability to repay or service debt even as some orthodox economists at times express concern over whether a sovereign government can "pay its bills." Instead, the orthodox view of fiscal sustainability rooted in the IGBC has to do with whether the combination of debt and interest will combine to create unbounded increases in interest payments, which eventually lead to rising inflation or default on the obligations in order to avoid inflation. This analysis is itself rooted in the GBC view of "monetization" and the loanable funds market view of interest rate determination (including the supposed "non-traditional" effects of

deficits), both of which are inapplicable to a modern money regime. As demonstrated in the previous section, "monetization" versus "financing" of a deficit is a false dichotomy, while interest on the national debt is a monetary phenomenon. The flawed foundations of the orthodox analysis of fiscal sustainability call for an alternative understanding of sustainable macroeconomic policy that is consistent with a modern money regime, which is the subject of this section.

Figure 4 shows the U. S. debt-to-GDP ratio during 1790-2004. The current level of the ratio sits at just below 40 percent. Some argue that the ratio is actually significantly higher than this once the Social Security and Medicare trust funds are considered, but interest payments on these trust funds are intergovernmental transfers and thus unrelated to the concept of sustainability as defined by the IGBC; thus the national debt excluding these trust funds—as shown in Figure 4—is the relevant measure in this case (see note 4). From Figure 4, it is clear that the ratio has not remained constant, and it would seem arbitrary to suggest that the ratio should converge in the future at any particular ratio even though the IGBC sets this as the criterion for sustainability in equations (13) and (14) above. Blanchard et al. (1990) recognize this and readily allow that "the requirement that the ratio of debt to [GDP] eventually returns to its initial level is clearly not very convincing. A policy aimed at stabilizing the debt to [GDP] ratio at 40 per cent rather than 20 percent should clearly not be characterized as an unsustainable fiscal policy" (p. 14).

Indeed, since it is the unbounded increase in interest payments as a percent of GDP that is the key characteristic of an unsustainable fiscal policy, Blanchard et al. (ibid.) demonstrate that the condition of sustainability "will hold as long as the debt to [GDP] ratio converges to any ratio, not only the initial one. It may even hold if the ratio grows forever as long as it does not grow eventually at a rate equal to or greater than $(r - \Theta)$ [i.e., the real interest rate less the growth rate of real GDP]" (p. 14). Of course, this the basic condition has been well known at least since Domar (1944), who showed that "the problem of the debt burden is a problem of an expanding national income" (p. 817) relative to the rate of interest. As in Domar's paper, Blanchard et al. (1990) agree that "if $(r - \Theta)$ were negative, the government would no longer need to generate primary surpluses to achieve sustainability. . . . The government could even run permanent primary deficits of any size, and these would eventually lead to a positive but constant level of debt, $[g - t]/(r - \Theta)$" (p. 15). Table 2 illustrates this point by assuming the real interest rate (r) is one percent below the real GDP growth rate (Θ); that is, in Table 2 the real interest rate is 2 percent and 1 percent, respectively coupled with real GDP growth rates of 3 percent and 2 percent. Gokhale and Smetters (2003a) assumed a real interest rate equal to 3.6 percent; Table 2 utilizes their assumptions for starting values of other macroeconomic variables just as in Table 1 previously, the only difference being the lower real interest rate in this case. As predicted by both Blanchard et al. (1990) and Domar (1944), in Table 2 the fiscal imbalance remains at zero even with primary deficits equal to 0.47 percent of GDP into perpetuity for either real GDP growth rate. Interest as a percent of GDP remains at 0.93 percent and 0.47 percent of GDP into perpetuity, respectively, with a total deficit of 1.4 percent and 0.94 percent of GDP, respectively.

Alas, Blanchard et al. (ibid.) note, "There is general agreement that the condition of an excess of the interest rate over the growth rate probably holds, if not always, at least in the medium and long run" (p. 15). In calculating the $44 trillion "fiscal imbalance," Gokhale and Smetters (2003a) likewise assume a two percent growth rate of real GDP into perpetuity, while they "use a real discount rate of 3.6 percent per year, corresponding to the average yield on thirty-year Treasury bonds during the past several years" (p. 23). Both of these points are highly questionable empirically. Regarding the latter point, Figure 5 shows that the average maturity of debt outstanding during the past 25 years has never been above 70 months and stood at 53 months at the end of 2005; likewise, the average maturity of Treasuries issued has not been above 90 months during this period and is currently at 36 months. Thus, the use of a thirty-year Treasury is an inappropriate as a proxy for the average Treasury rate, if not an attempt to (disingenuously?) set the Treasury's rate paid as high as possible (since long-term rates are usually higher than short-term rates as a result of maturity premiums).

Considering instead the benchmark three-month and ten-year Treasury rates as proxies for average Treasury rates is clearly a more legitimate approach, as average maturity of issuance and outstanding nearly always fall within the range set by the two rates. Figure 6 plots *ex post* real rates for three-month Treasuries during 1953:2 – 2006:1, on a four-quarter moving average basis and using the PCE deflator as the inflation measure. (Recall that it is the *ex post* measure of the real rate that is of concern in the IGBC framework.) The dotted line in the figure represents Gokhale and Smetters' (2003a) assumed 3.6 percent real rate. Figure 6 clearly shows that the *ex post* real rate on three-month Treasuries has rarely been above 3.6 percent. Consistent with the monetary nature of Treasury rates in a modern money regime, the plots in Figure 6 follow Fed policy shifts in 1979:4 to high interest rates and then another shift in 2001:1 back to much lower rates as in the pre-1979 sub-period. Figure 7 plots *ex post* real rates for ten-year Treasuries, again measuring inflation with the PCE deflator while assuming inflation is two percent after 2006 (note that a higher assumed inflation rate would send the *ex post* real rates *lower* than shown in the figure). *Ex post* ten-year real rates also exhibit a pattern that follows the Fed's policy shifts to high rates in 1979:4 and then back in 2001:1. The influence of Fed policy shifts is seen further by considering the average rates for the different sub-periods in Table 3, which are shown in Figures 6 and 7 with dark horizontal lines. For all sub-periods, note that only the ten-year *ex post* real rate during 1979:4 – 2000:4 has an average above 3.6 percent, while averages for the entire period are below this level for both the *ex post* three-month and ten-year real rates. In sum, data on *ex post* real Treasury rates shows that the Fed's policy stance is the significant force, not the size of the deficit or other forces presumed in the loanable funds approach.

Contrary to Blanchard et al.'s (1990) statement, note from Table 3 that *ex post* real rates have been less than the average real GDP growth rate of around three percent for the entire 1953:2 – 2006:1 time period; the only exception was during the 1979:4 – 2000:4 sub-period in which the Fed pursued a high interest rate policy on average. While Gokhale and Smetters (2003a) suggest—and the proposed Honest Government Accounting Act would have *required*—that the IGBC be calculated at the infinite horizon, it is well known that such infinite horizon calculations are meaningless if the rate of real GDP growth is greater than the rate of real interest. The simplest example of this is shown in equation (15) below (identical to equation (12), but explicitly noted here that $n = \infty$), which assumes a constant primary deficit as a percent of GDP into perpetuity.

$$(15) \qquad \textit{Fiscal Imbalance} = b_0 + \sum_{k=0}^{\infty} \frac{g_k - t_k}{\left(1 + r - \Theta\right)^k} = b_0 + \frac{g - t}{r - \Theta}$$

In particular, if $r < \Theta$, then increasingly larger primary deficits *improve* the fiscal imbalance, whereas primary surpluses *worsen* it. This shortcoming is, of course, in addition to the measure's overwhelming inconsistency with the nature of deficits and interest rates in a modern money regime.

A straightforward way to view the "rates versus GDP growth" comparison is to consider them both in nominal terms rather than attempting to "deflate" both and since it is in fact the essence of the issue of "fiscal sustainability." Figure 8 shows nominal three-month and ten-year Treasury rates less nominal GDP growth during 1953:2 – 2006:1, calculated as two-year moving averages to smooth quarterly volatility. Perhaps even more dramatically than in Figures 6 and 7, Figure 8 demonstrates the monetary nature of Treasury rates. First, the Fed's shift to high rate policy during 1979:4 – 2000:4 is obvious. Average rates for the sub-periods are shown with bold horizontal lines in the figure and are listed in Table 4; again, only during the 1979:4 – 2000:4 sub-period did nominal rates exceed nominal GDP growth. Second, the smoothing effect of the two-year moving average illustrates how closely changes in long-term Treasury rates move with changes in short-term Treasury rates that are themselves anchored rather tightly to the Fed's target. Not surprisingly, the pattern of interest outlays on the national debt as a percent of GDP shown in Figure 9 also follows the overall pattern of interest rates versus nominal GDP growth in Figure 8. Note that the return to federal government deficits in the three-to-four

percent of GDP range since 2002 has not resulted in rising interest payments as a percent of GDP given the low interest rates relative to GDP growth during the period.

A key factor in the orthodox view of fiscal sustainability is the assumption of full employment in the "long run." While it is almost always granted that during recessions fiscal deficits are beneficial, long-run or persistent (primary) deficits are almost without exception viewed negatively for the reasons discussed previously in the paper: persistent (primary) deficits are assumed to reduce national saving given that the economy will already be at its potential output; deficits thereby are assumed to raise interest rates and eventually put the national economy on an unsustainable path that ultimately ends in economic depression, hyperinflation, or both. However, the message is not just that persistent deficits result in economic ruin, but that the orthodox assumption of full employment means that persistent deficits are *unnecessary* in the first place. According to this view, any proposal of persistent deficits as a solution to any particular problem therefore not only misunderstands the consequences, but also misunderstands the nature of the problem.

While this is not the place for a complete elaboration of alternative views, there are at least two points to make regarding this "long run" stability assumption of orthodox analysis. First, Keynes, of course, rejected the view that the economy was self-stabilizing in the "long run" *even if* nominal prices or wages were flexible. Most, if not all, Post Keynesians similarly argue that insufficient aggregate demand or (equivalently) excessive desired aggregate net saving (as in Japan) is a persistent or at least frequent problem in modern capitalist economies, and therefore persistent federal government deficits may be required to fill the "gap." These economists often subscribe to a Lerner-type functional finance approach in which it is the potential stabilizing effects of a government's deficit—as opposed to whether the deficit is consistent with the orthodox principle of "sound finance"—that determine whether a deficit should be incurred (e.g., Arestis and Sawyer, 2003; Mosler, 1997-8; Nell and Forstater, 2003; Wray, 1998). Second, Minsky, like Keynes, viewed government deficits as frequently necessary for maintaining full employment, but viewed them as particularly important for the financial stability of the economy. Recent extensions of Minsky's analysis—particularly by researchers at the Levy Institute—have made use of the national income accounting and flow of funds identities showing that government deficits are necessarily equal to non-government saving to demonstrate that persistent government deficits might be necessary to enable less fragile balance sheet structures in the non-government sector (e.g., Godley, 1999; Wray, 2006b). As Figure 10 shows, government and domestic non-government sector net saving are near mirror images of each other (because the non-government sector in Figure 10 excludes the net saving of the foreign sector, the two are not *perfect* mirror images); in other words, persistently positive financial balances in the domestic non-government sector (i.e., positive net saving) may require persistent deficits in the government sector (i.e., negative net saving).

If the proposition that persistent or at least frequent deficits are a legitimate—if not necessary—policy tool for macroeconomic stabilization (and possibly other ends as well) is taken seriously, the monetary nature of interest paid on the national debt provides one of the means for using the tool. For instance, Table 5 shows primary deficit and interest combinations for a hypothetical economy growing at a six percent nominal rate per year on average (as Table 4 shows, the U. S. average has been 6.75 percent during 1953:2 – 2006:1) and beginning with a debt-to-GDP ratio of 50 percent. Interest payments as a percent of GDP at 30-year and 75-year intervals are calculated for persistent primary deficits of two, four, and six percent of GDP, while interest rates are assumed to be set *below* the rate of GDP growth. Also, the year and level of interest rate payment convergence to a constant level of GDP are shown (thus, *all* of the scenarios in Table 5 are "sustainable" paths *in theory* according to the IGBC approach). Finally, as Arestis and Sawyer (2003) note, interest payments are subject to income taxes, and thus actual net interest paid will be less than the nominal interest rate; Table 5 shows interest payments with a 20 percent tax rate, which is a conservative assumption given that most bond holders would be in high tax brackets. As the table shows (and as is fairly intuitive), persistent primary deficits—even six percent of GDP—may not generate overly large interest payments if the interest rate is significantly less than the GDP growth rate.

This is particularly true if taxation of interest is assumed, which is obviously the more realistic scenario. However (and, again, intuitively), this becomes less true as the interest rate is increased relative to GDP growth, even as the rise in interest payments and thus in the debt-to-GDP ratio is ultimately bounded.

As such, whereas orthodoxy has assumed full employment and cautioned against the eventual (hyper) inflationary effects of persistent deficits, a rethinking of what constitutes sustainable macroeconomic policy is in order. Recall once again that in a modern money regime there is no question regarding the federal government's *abilities* to "pay its bills" or to set the interest rate at which it services its debt. As such, if in fact a functional finance-type approach to macroeconomic stabilization policy is the appropriate one, it follows that *what is unsustainable is a high interest rate monetary policy* since interest rates on the national debt are in fact set by monetary policy. Not only do high interest rate policies directly lead to significant increases in interest payments as a percent of GDP, but they also *indirectly* raise interest payments if they slow the economy and engender a higher debt-ratio as a result of automatic stabilizers or other countercyclical fiscal policies to end recessions (as likely contributed to the rise in interest payments during the 1980s shown in Figure 9). An interest rate policy that is unsustainable could be defined as one in which rates on the national debt are held above the rate of nominal GDP growth. Clearly the Fed's high interest rate policies during 1979:4 – 2000:4 were unsustainable in a world in which macroeconomic instability of the sorts that Keynes and Minsky described are prevalent. But Table 5 also shows that—from a functional finance perspective—some monetary policies in which interest rates are set at moderately high levels but still below the rate of GDP growth can also be essentially unsustainable if sizeable, persistent deficits are required for attaining permanent full employment and macroeconomic stability.

To conclude this section, Figure 8 shows that interest on Treasuries has fallen considerably below nominal GDP growth since 2001 and is in stark contrast to the 1979:4 – 2000:4 period. While many analysts presume that recent low rates have been the anomaly and will soon return to the previous period's levels, an understanding of sustainable macroeconomic policy in the current environment suggests otherwise. As reported in numerous Levy Instituted publications during the past several years, and as shown in Figure 10, the financial balance of the domestic private sector has been negative since the late 1990s (not coincidentally, the balance turned negative as the federal government began to run surpluses). The continued negative trend for the balance has been mostly concentrated in the household sector, where virtually every measure of household debt, debt-to-income, and debt service as a percent of income is at or near an all-time high. While the federal government is not financially constrained (and thus cannot become what Minsky called a Ponzi unit (Wray, 2006b)), households clearly are and they therefore must obtain cash flows via income, borrowing, or asset sales in order to be able to service their debts. In this environment, a return to a high interest rate policy at the Fed is ultimately unsustainable on two grounds: as above it would significantly raise the Treasury's interest payments as large deficits eventually become necessary to raise the domestic private sector's financial balance,[11] but it would also reduce the ability of households to service their current record-high debts (an increasingly large proportion of which are floating-rate). Thus, in addition to the unsustainability of a high interest rate policy over the longer term as described throughout this section, it is highly doubtful that the Fed could succeed in substantially raising short-term rates in the near future without enabling a classic Minskyan debt deflation in the domestic private sector.[12] Indeed, from the Minskyan perspective, a high interest rate policy is ultimately unsustainable as long as at least one sector of the economy—government, non-

[11] The alternative to increased government deficits for improving the private sector balance is a substantially reduced current account deficit, which is unlikely in the near term given the export-driven policies in many other large economies (e.g., Wray, 2006b).

[12] Note that regardless of one's position on whether there is or was a real estate "bubble" or whether real estate prices will collapse or simply grow more slowly, U. S. households have clearly taken speculative (in the Minskyan sense) financial positions—particularly in regard to the recent proliferation of "non-traditional" mortgages—in which they are reliant upon low interest rates in order to service their debts.

government domestic, or foreign—has a persistently negative financial balance, which will not be uncommon since the three balances always net to zero.

Concluding Remarks

The sustainability of fiscal policy as determined via the orthodox IGBC framework is irrelevant for understanding the workings of a modern money economy. The orthodox framework's assumption that interest rates are determined in a loanable funds market for interest rate determination and the related assumption of differing inflationary impacts of "monetization" versus the "financing" of deficits are both fundamentally flawed. Instead, the orthodox view that fiscal deficits or international forces might have large effects on interest rates could be appropriate only for a non-sovereign-currency-issuing government operating under fixed exchange rates, not for a modern money regime with flexible exchange rates (Wray, 2006a). Consistent with the monetary nature of interest rates in a modern money regime, rates on Treasuries have followed the stance of monetary policy, not fiscal policy, and have only risen above the rate of GDP growth during times when high interest rate policies were set in place by monetary policy makers. And because interest rates on the national debt in a modern money regime are a matter of monetary policy, it follows that the stance of monetary policy has much to do with whether a given fiscal path is "sustainable" or not.

The "sound finance" view of fiscal policy is obviously central to the orthodox view of fiscal sustainability. As Blanchard et al. (1990) argue, "Sustainability is basically about good housekeeping. It is essentially about whether, based on the policy currently on the books, a government is headed towards excessive debt accumulation" (p. 8). By contrast, the functional finance view argues that it is involuntary unemployment and excessive unutilized capacity that a government and a nation cannot "afford." Much as the theoretical foundations for fiscal policies consistent with the philosophy of functional finance have been detailed by other researchers (e.g., Arestis and Sawyer, 2003; Bell, 2000; Forstater and Mosler, 2005; Mosler, 1995, 1997-8; Nell and Forstater, 2003; Wray, 1998, 2003) this paper contributes to the theoretical foundations for a monetary policy complement to these fiscal policies. The corollary here is the importance of recognizing that a nation similarly cannot "afford" high-interest-rate monetary policies if it also wants to pursue true, full employment policy while ensuring that whatever fiscal deficits incurred in the process are not inflationary. The monetary policies implemented by the Fed during 1979:4 – 2000:4 stand out as being remarkably "unsustainable" in this regard. Another necessary—though, admittedly, not sufficient—hurdle to overcome in the progression toward a functional finance-based macroeconomic policy is to abandon analyses based on the flawed IGBC framework currently employed by numerous government offices. In short, if it is true that involuntary unemployment is a frequent—if not persistent—characteristic of a modern capitalist system as Keynes, Minsky, and many others have concluded, then the nation most certainly cannot "afford" to have its policies run according to such a mistaken analytical framework as the one at the heart of the misguided and tragically mislabeled Honest Government Accounting Act.

References

Anderson, Richard G. and Jason Buol. 2005. "Revisions to User Costs for the Federal Reserve Bank of St. Louis Monetary Services Indices." Federal Reserve Bank of St. Louis *Review*, vol. 87, no. 6 (November/December): 735-749.

Anderson, Richard G. and Robert H. Rasche. 1996. "Measuring the Adjusted Monetary Base in an Era of Financial Change." Federal Reserve Bank of St. Louis *Review*, vol. 78, no. 6 (November/December): 3-37.

Anderson, Richard G., Robert H. Rasche, and Jeffrey Loesel. 2003. "A Reconstruction of the Federal Reserve Bank of St. Louis Adjusted Monetary Base and Reserves." Federal Reserve Bank of St. Louis *Review*, vol. 85, no. 5 (September/October): 39-70.

Arestis, Philip and Malcolm Sawyer. 2003. "The Case for Fiscal Policy." Jerome Levy Economics Institute Working Paper No. 382 (May).

Auerbach, Alan J. 1994. "The U.S. Fiscal Problem: Where We Are, How We Got Here, and Where We Are Going." In *NBER Macroeconomics Annual*, edited by Stanley Fischer and Julio Rotemberg. Cambridge, MA: National Bureau of Economic Research, 141-175.

Auerbach, Alan J, William G. Gale, Peter R. Orszag, and Samara R. Potter. 2003. "Budget Blues: The Fiscal Outlook and Options for Reform." In *Agenda for the Nation,* edited by Henry J. Aaron, James M. Lindsey, and Pietro S. Nivola, 109-145. Washington, D. C.: The Brookings Institution.

Barnett, William A.. 1980. "Economic Monetary Aggregates: An Application of Index Number and Aggregation Theory." *Journal of Econometrics*, vol. 15, no. 1 (March): 11-48.

Bartolini, Leonardo, Spence Hilton, and Alessandro Prati. 2005. "Money Market Integration." Federal Reserve Bank of New York Working Paper (October).

Bell, Stephanie A. 2000. "Do Taxes and Bonds Finance Government Spending?" *Journal of Economic Issues*, vol. 34, no. 3 (September): 603-620.

Bell, Stephanie A. and L. Randall Wray. 2002-3. "Fiscal Effects on Reserves and the Independence of the Fed." *Journal of Post Keynesian Economics*, vol. 25, no. 2 (Winter): 263-271.

_____. 2000. "Financial Aspects of the Social Security 'Problem.'" *Journal of Economic Issues*, vol. 34, no. 2 (June): 357-364.

Bernanke, Ben. 2004. "Central Bank Talk and Monetary Policy." Speech given at the Japan Society Corporate Luncheon, New York, NY (October 7).

Bernheim, B. Douglas. 1989. "A Neoclassical Perspective on Budget Deficits." *Journal of Economic Perspectives*, vol. 3, no. 2 (Spring): 55-72.

Blanchard, Olivier, Jean-Claude Chouraqui, Robert P. Hagemann, and Nicola Sartor. 1990. "The Sustainability of Fiscal Policy: New Answers to an Old Question." *OECD Economic Studies* 15 (Autumn): 7-36.

Clouse, James A. and Douglas W. Elmendorf. 1997. "Declining Required Reserve Balances and the Volatility of the Federal Funds Rate." Federal Reserve Board Finance and Economics Discussion Series (June).

CNN Money. 2006. "Administration Defends Budget Cuts to Education, Healthcare." February 6. Internet: http://www.cnn.com/2006/POLITICS/02/07/budget.ap/index.html.

Congressional Budget Office. 2005b. *The Long-Term Budget Outlook.* December 15. Internet: http://www.cbo.gov/ftpdocs/69xx/doc6982/12-15-LongTermOutlook.pdf

_____. 2005a. "Long-Term Economic Effects of Chronically Large Federal Deficits." *CBO Economic and Budget Issue Brief* (October 13).

Cyree, Ken B., Mark D. Griffiths, and Drew B. Winters. "On the Pervasive Effects of Federal Reserve Settlement Regulations." Federal Reserve Bank of St. Louis *Review* (March/April 2003): 27-46.

DeCorleto, Donna A. and Theresa A. Trimble. 2004. "Federal Reserve Banks as Fiscal Agents and Depositories of the United States in a Changing Financial Environment." *Federal Reserve Bulletin* (Autumn): 435-446.

Demiralp, Selva and Dennis Farley. 2005. "Declining Required Reserves, Funds Rate Volatility, and Open Market Operations." *Journal of Banking and Finance*, vol. 29, no. 5 (May): 1131-1152.

Demiralp, Selva, Brian Preslopsky, and William Whitesell. 2004. "Overnight Interbank Loan Markets." Federal Reserve Board, Finance and Economics Discussion Series (May).

Despeignes, Peronet. 2003. "Report Warns of Chronic U.S. Deficits." *The Financial Times* (May 29).

Domar, Evsey D. 1944. "The 'Burden of the Debt' and the National Income." *American Economic Review* (December): 798-827.

Elmendorf, Douglas W., and N. Gregory Mankiw. 1999. "Government Debt." In *Handbook of Macroeconomics*, Vol. 1C, edited by John B. Taylor and Michael Woodford. Amsterdam: Elsevier Science, 1615-1669.

Engen, Eric and R. Glenn Hubbard. 2004. "Federal Government Debts and Interest Rates." NBER Working Paper No. 10681 (August).

Feldstein, Martin S. 1986. "Budget Deficits, Tax Rules, and Real Interest Rates." NBER Working Paper No. 1970 (July).

Ferguson, Niall and Laurence J. Kotlikoff. 2003. "Going Critical: American Power and the Consequences of Fiscal Overstretch." *The National Interest* (Fall): 22-32.

Fisher, Peter. 2003. "America Must Plan Prudently for the Future." *The Financial Times* (March 26).

Fontana, Guiseppe and Alfonso Palacio-Vera. 2004. "Monetary Policy Uncovered: Theory and Practice." *International Review of Applied Economics*, vol. 18, no. 1 (January): 25-41.

Forstater, Mathew and Warren Mosler. 2005. "The Natural Rate of Interest Is Zero." *Journal of Economic Issues*, vol. 39, no. 2 (June): 535-542.

Friedman, Benjamin M. 2000. "Decoupling at the Margin: The Threat to Monetary Policy from the Electronic Revolution in Banking." *International Finance*, vol. 3, no. 2 (July): 261-272.

_____. 1999. "The Future of Monetary Policy: The Central Bank as an Army with Only a Signal Corps." *International Finance*, vol. 2, no. 3 (December): 321-338.

Fullwiler, Scott T. 2006. "Setting Interest Rates in the Modern Money Era." *Journal of Post Keynesian Economics* 28 (3) (Spring): 495-525.

_____. 2005. "Paying Interest on Reserve Balances: It's More Significant Than You Think." *Journal of Economic Issues* 39 (2) (June): 543-550.

_____. 2003. "Timeliness and the Fed's Daily Tactics." *Journal of Economic Issues* 37 (4) (December): 851-880.

Furfine, Craig. 2000. "Interbank Payments and the Daily Federal Funds Rate." *Journal of Monetary Economics*, vol. 46, no. 1 (August): 535-553.

Galbraith, James K. 2005. "Breaking Out of the Deficit Trap: The Case Against the Fiscal Hawks." Jerome Levy Economics Institute Public Policy Brief No. 81 (June).

Gale, William G., and Peter R. Orszag. 2004. "Budget Deficits, National Saving, and Interest Rates." *Brookings Papers on Economic Activity* 2: 101-211.

Garbade, Kenneth D. 2004. "Originas of the Federal Reserve Book-Entry System." Federal Reserve Bank of New York *Economic Policy Review*, vol. 10, no. 3 (December): 33-50.

Garbade, Kenneth D., John C. Partlan, and Paul J. Santoro. 2004. "Recent Innovations in Treasury Cash Management." Federal Reserve Bank of New York *Current Issues in Economics and Finance*, vol. 10 (November).

Godley, Wynne. 1999. "Seven Unsustainable Processes." Jerome Levy Economics Institute Special Report (January).

Gokhale, Jagadeesh and Kent Smetters. 2003b. "America's Budget Book-Keeping Scandal." *The Financial Times* (September 7).

_____. 2003a. *Fiscal and Generational Imbalances: New Budget Measures for New Budget Priorities.* Washington, D. C: American Enterprise Institute.

Griffiths, Mark D. and Drew B. Winters. "The Effect of Federal Reserve Accounting Rules on the Overnight Equilibrium Levels of Repo Rates." *Journal of Banking and Finance*, vol. 24, no. 6 (July 1997): 815-832.

_____. 1995. "Day-of-Week Effects in the Federal Funds Rate: Further Empirical Findings." *Journal of Banking and Finance*, vol. 19, no. 7 (October): 1265-1284.

Guthrie, Graeme and Julian Wright. 2000. "Open Mouth Operations." *Journal of Monetary Economics* 46 (2): 489-516.

Hamilton, John. 1997. "Measuring the Liquidity Effect." *American Economic Review*, vol. 87, no. 1 (March): 80-97.

_____. 1996. "The Daily Market for Federal Funds." *Journal of Political Economy*, vol. 104, no. 1 (February): 16-56.

Hilton, Spence. 2005. "Trends in Federal Funds Rate Volatility." Federal Reserve Bank of New York *Current Issues in Economics and Finance*, vol. 11, no. 7 (July).

Keynes, John Maynard. 1964 (1936). *The General Theory of Employment, Interest, and Money.* New York: Harcourt Brace.

King, Mervyn. 1999. "Challenges for Monetary Policy: New and Old." In *New Challenges for Monetary Policy: A Symposium Sponsored by the Federal Reserve Bank of Kansas City*. Kansas City, MO: Federal Reserve Bank of Kansas City, pp. 11-58.

Kotlikoff, Laurence J. 1992. *Generational Accounting: Knowing Who Pays, and When, for What We Spend*. New York, NY: Free Press.

Kotlikoff, Laurence J. and Scott Burns. 2004. *The Coming Generational Storm*. Cambridge, MA: MIT Press.

Kotlikoff, Laurence J. and Jeffrey Sachs. 2003. Editorial in *The Boston Globe* (May 19).

Krieger, Sandra C. 2000. "Recent Trends in Monetary Policy Implementation: A View from the Desk." Federal Reserve Bank of New York *Economic Policy Review*, vol. 8, no. 1 (May): 73-76.

Lacker, Jeffrey M. 2006. "Central Bank Credit in the Theory of Money and Payments." Speech at the Economics of Payments II Conference, Federal Reserve Bank of New York (March 29).

Lang, Richard W. 1979. "TTL Note Accounts and the Money Supply Process." Federal Reserve Bank of St. Louis *Review* (October): 3-14.

Laubach, Thomas. 2003. "New Evidence on the Interest Rate Effects of Budget Deficits and Debt." Federal Reserve Finance and Economics Discussion Series 2003-12 (May).

Lavoie, Marc. 2005. "Monetary Base Endogeneity and the New Procedures of the Asset-Based Canadian and American Systems." *Journal of Post Keynesian Economics*, vol. 27, no. 4 (Summer): 689-710.

Lee, Young-Sook. "The Federal Funds Market and the Overnight Eurodollar Market." *Journal of Banking and Finance* 27 (2003): 749-771.

Lerner, Abba. 1943. "Functional Finance and the Federal Debt." *Social Research*, vol. 10, no. 1 (February): 38-51.

Lovett, Joan E. 1978. "Treasury Tax and Loan Accounts and Federal Reserve Open Market Operations." Federal Reserve Bank of New York *Quarterly Review*, vol. 3, no. 2 (Summer): 41-46.

McCallum, Bennett T. 1988. "Robustness Properties of a Monetary Policy Rule." *Carnegie-Rochester Conference Series on Public Policy*, vol. 29, pp. 173-204.

McCulley, Paul. 2003. "Fed Focus." October. Internet: www.pimco.com.

Meulendyke, Ann-Marie. 1998. *Financial Markets and Monetary Policy*, 2nd Edition. New York: Federal Reserve Bank of New York.

_____. 1988. "Can the Federal Reserve Influence Whether the Money Supply Is Endogenous? A Comment on Moore." *Journal of Post Keynesian Economics*, vol. 10, no. 1 (Spring): 390-397.

Mitchell, William and Warren Mosler. 2005. "Essential Elements of a Modern Monetary Economy with Applications to the Social Security Privatisation and the Intergenerational Debate." Centre of Full Employment and Equity Working Paper No. 05-01 (February).

Moore, Basil J. 1988: *Horizontalists and Verticalists: The Macroeconomics of Credit Money*. Cambridge: Cambridge University Press.

Mosler, Warren. 1997-8. "Full Employment and Price Stability." *Journal of Post Keynesian Economics*, vol. 20, no. 2 (Winter): 167-182.

_____. 1995. "Soft Currency Economics." Internet: www.epicoalition.org

Mühleisen, Martin, and Christopher Towe (eds.). 2004. *U.S. Fiscal Policies and Priorities for Long-Run Sustainability*. International Monetary Fund Occasional Paper No. 227. Washington, D.C.

Nell, Edward J. and Mathew Forstater (eds.). 2003. *Reinventing Functional Finance: Transformational Growth and Full Employment*. Northampton: Edward Elgar.

Office of Management and Budget. 2005. *Budget of the United States Government: Fiscal Year 2005 Budget.*

Office of Debt Management. 2006. "Presentation to the Treasury Borrowing Advisory Committee," January 31. Internet: http://www.treasury.gov/offices/domestic-finance/debt-management/adv-com/minutes/dc-2006-q1.pdf

Palley, Thomas I. 2001-2. "The E-Money Revolution : Challenges and Implications for Monetary Policy." *Journal of Post Keynesian Economics*, vol. 24, no. 2 (Winter): 217-233.

Panigay Coleman, Stacy. 2002. "The Evolution of the Federal Reserve's Intraday Credit Policies." Federal Reserve *Bulletin* (February): 67-84.

Poole, William. 2006. "Inversion." Speech at the Global Interdependence Center Central Bank Series, Federal Reserve Bank of Philadelphia (May 18).

_____. 1970. "Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model." *The Quarterly Journal of Economics*, vol. 84, no. 2 (May): 197-216.

Rubin, Robert E., Peter R. Orszag, and Allen Sinai. 2004. "Sustained Budget Deficits: Longer-Run U. S. Economic Performance and the Risk of Financial Disarray." Paper presented at the annual meetings of the American Economics Association, San Diego, CA (January 4).

Rudebusch, Glenn D., Eric T. Swanson, and Tao Wu. 2006. "The Bond Yield 'Conundrum' from a Macro Finance Perspective." Federal Reserve Bank of San Francisco Working Paper No. 2006-16 (May).

Taylor, John B. 1993. "Discretion versus Policy Rules in Practice." *Carnegie-Rochester Conference Series on Public Policy*, vol. 39 (December): 195-214.

Thornton, Daniel L. 2006. "The Daily Liquidity Effect." Federal Reserve Bank of St. Louis Working Paper No. 2006-020A (April).

_____. 2004. "The Fed and Short-Term Rates: Is It Open Market Operations, Open Mouth Operations, or Interest Rate Smoothing?" *Journal of Banking and Finance*, vol. 28, no. 3 (March): 475-498.

Walsh, Carl E. 2003. *Monetary Theory and Policy*, 2nd Edition. Cambridge, MA: The MIT Press.

Whitesell, William. 2006. "Monetary Policy Implementation without Averaging or Rate Corridors." Federal Reserve Finance and Economics Discussion Series No. 2006-22.

Woodford, Michael. 2001. "Monetary Policy in the Information Economy." *Economic Policy for the Information Economy: A Symposium Sponsored by the Federal Reserve Bank of Kansas City*. Kansas City, MO: Federal Reserve Bank of Kansas City, pp. 297-370.

Wray, L. Randall. 2006b. "Twin Deficits and Sustainability." Jerome Levy Economics Institute Public Policy Brief No. 2006/3 (April).

_____. 2006a. "Understanding Policy in a Floating Rate Regime." Center for Full Employment and Price Stability Working Paper No. 51 (January).

_____. 2003-4. "Loanable Funds, Liquidity Preference, and Endogenous Money: Do Credit Cards Matter?" *Journal of Post Keynesian Economics*, vol. 26, no. 2 (Winter): 309-323.

_____. 2003. "Seigniorage or Sovereignty?" In Sergio Rossi and Louis Philippe-Rochon (eds.), *Modern Theories of Money: The Nature and Role of Money in Capitalist Economies*. Cheltenham, UK: Edward Elgar, pp. 84-102.

_____. 1998. *Understanding Modern Money: The Key to Full Employment and Price Stability*. Cheltenham, UK: Edward Elgar.

Wu, Tao. 2005. "The Long-Term Rate Conundrum: Not Unraveled Yet?" Federal Reserve Bank of San Francisco *FRBSF Economics Letter* (April 29).

Table 1: Gokhale and Smetters' Sustainable and Unsustainable Fiscal Policies

Infinite Horizon				In 30 Years			In 75 Years		
Real GDP	Fiscal Imbalance	Primary Deficit	PV of future Primary						
Θ	Eq. (12)	g-t	Deficits	int/GDP	Δb_{30}	b_{30}	int/GDP	Δb_{75}	b_{75}
3%	0	-0.28%	-5,137	1.68%	1.4%	48.0%	1.68%	1.4%	48.0%
3%	44,214	2.13%	39,077	4.33%	6.45%	126.7%	9.43%	11.56%	273.6%
2%	0	-0.75%	-5,137	1.69%	0.94%	48.0%	1.69%	0.94%	48.0%
2%	44,214	5.73%	39,077	10.01%	15.74%	293.9%	33.25%	38.98%	962.6%

Table 2: Gokhale and Smetters' Sustainable Fiscal Policy with Θ - r = 1%

Infinite Horizon				In 30 Years			In 75 Years		
Real GDP	Fiscal Imbalance	Primary Deficit	PV of future Primary						
Θ	Eq. (12)	g-t	Deficits	int/GDP	Δb_{30}	b_{30}	int/GDP	Δb_{75}	b_{75}
3%	0	0.47%	-5,137	0.93%	1.4%	48.0%	0.93%	1.4%	48.0%
2%	0	0.47%	-5,137	0.47%	0.94%	48.0%	0.47%	0.94%	48.0%

Table 3: Average *Ex Post* Real Rates

Period	3-Month Real Rate (*ex post)*	10-Year Real Rate (*ex post)*
1953:2 - 1979:3	0.75%	-0.56%
1979:4 - 2000:4	3.36%	5.53%
2001:1 - 2006:1	0.04%	2.41%
1953:2 - 2006:1	1.72%	2.18%

Table 4: Nominal GDP Growth and Nominal Interest Rates

	1953:2 - 1979:3	1979:4 - 2000:4	2001:1 - 2006:1	1953:2 - 2006:1
Ave 3-Month Rate	4.36%	6.88%	2.27%	5.16%
Ave 10-Year Rate	5.33%	8.50%	4.41%	6.51%
Ave GDP Growth	7.37%	6.38%	5.18%	6.75%
3-Month Rate — GDP Growth	-3.01%	0.50%	-2.91%	-1.59%
10-Year Rate — GDP Growth	-2.04%	2.12%	-0.77%	-0.24%

Table 5: Interest Outlays for Deficit and Interest Rate Combinations

Assuming Nominal GDP Growth = 6% and Starting Debt/GDP = 50%

Interest Rate	Annual Primary Deficit	Interest in 30 Years		Interest in 75 Years		Convergence Year and Interest	
		tax=0%	tax=20%	tax=0%	tax=20%	tax=0%	tax=20%
1%	2%	0.42%	0.32%	0.40%	0.31%	Year 57, 0.40%	Year 46, 0.31%
	4%	0.72%	0.56%	0.79%	0.61%	Year 88, 0.80%	Year 129, 0.62%
	6%	1.02%	0.80%	1.18%	0.91%	Year 105, 1.2%	Year 85, 0.92%
2%	2%	0.98%	0.74%	1.00%	0.73%	Year 65, 1.0%	Year 31, 0.73%
	4%	1.65%	1.25%	1.94%	1.42%	Year 141, 2.0%	Year 103, 1.45%
	6%	2.33%	1.76%	2.88%	2.12%	Year 158, 3.0%	Year 128, 2.18%
3%	2%	1.75%	1.26%	1.93%	1.32%	Year 167, 2.0%	Year 94, 1.33%
	4%	2.88%	2.10%	3.69%	2.55%	Year 219, 4.0%	Year 199, 2.67%
	6%	4.01%	2.95%	5.45%	3.78%	Year 239, 6.0%	Year 185, 4.0%
4%	2%	2.78%	1.93%	3.48%	2.18%	Year 319, 4.0%	Year 263, 2.29%
	4%	4.48%	3.16%	6.51%	4.15%	Year 375, 8.0%	Year 232, 4.57%
	6%	6.18%	4.40%	9.53%	6.12%	Year 401, 12.0%	Year 294, 6.86%
5%	2%	4.20%	2.78%	6.21%	3.48%	Year 775, 10.0%	Year 319, 4.0%
	4%	6.60%	4.48%	11.25%	6.51%	Year 863, 20.0%	Year 375, 8.0%
	6%	9.00%	6.18%	16.29%	9.53%	Year 911, 30.0%	Year 401, 12.0%

Figure 1: Deficit without Bond Sale

Banks			Non-Bank Private Sector	
Assets	Liabilities		Assets	Liabilities
+ Reserves	+ Deposits		+ Deposits	

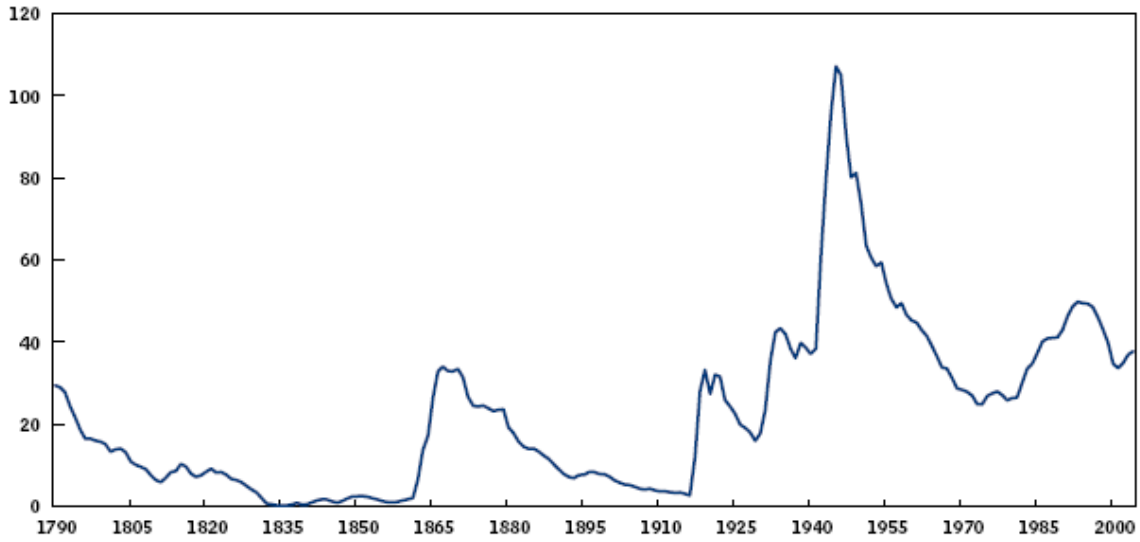
Figure 2: Deficit with Bond Sale to Bank

Banks			Non-Bank Private Sector	
Assets	Liabilities		Assets	Liabilities
+ Reserves	+ Deposits		+ Deposits	
- Reserves +Treasuries				

Figure 3: Deficit with Bond Sale to Non-Bank

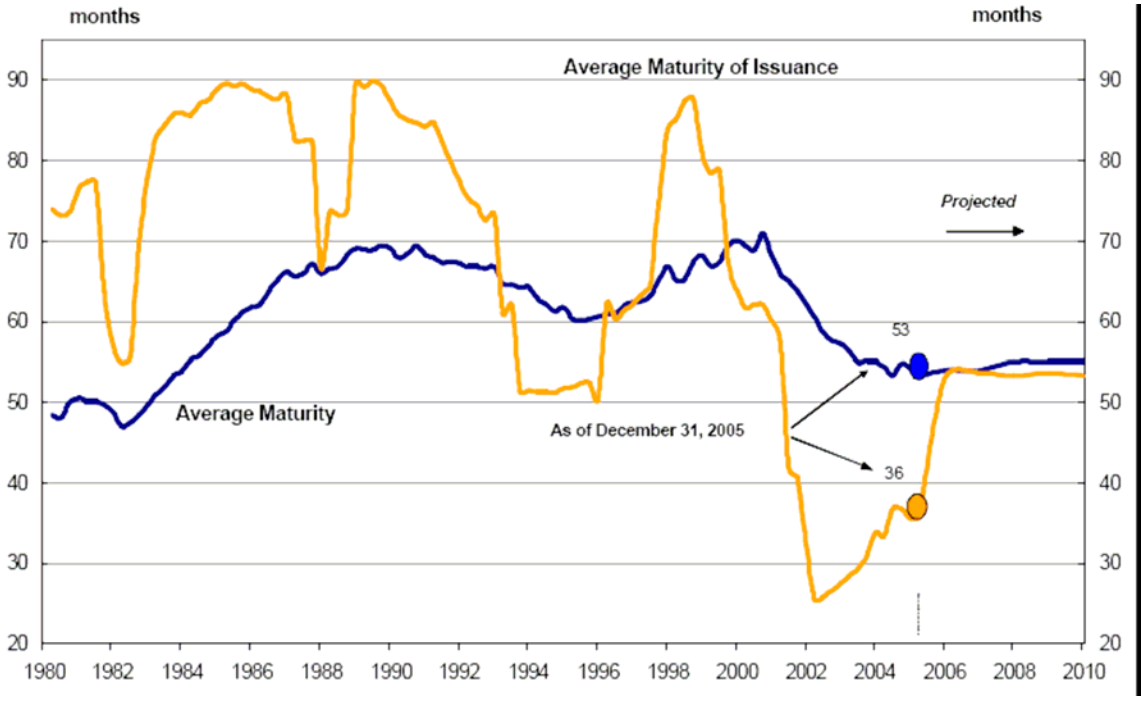
Banks			Non-Bank Private Sector	
Assets	Liabilities		Assets	Liabilities
+ Reserves	+ Deposits		+ Deposits	
- Reserves	- Deposits		- Deposits + Treasuries	

Figure 4: U. S. Federal Government Debt-to-GDP Ratio, 1790-2004



Source: Congressional Budget Office, 2005b, p. 16

Figure 5: Maturity Measures for Outstanding Treasuries



Source: Office of Debt Management, 2006, p. 10

Figure 6: *Ex Post* Real Rates on 3-Month Treasuries
(4 Quarter Moving Average)

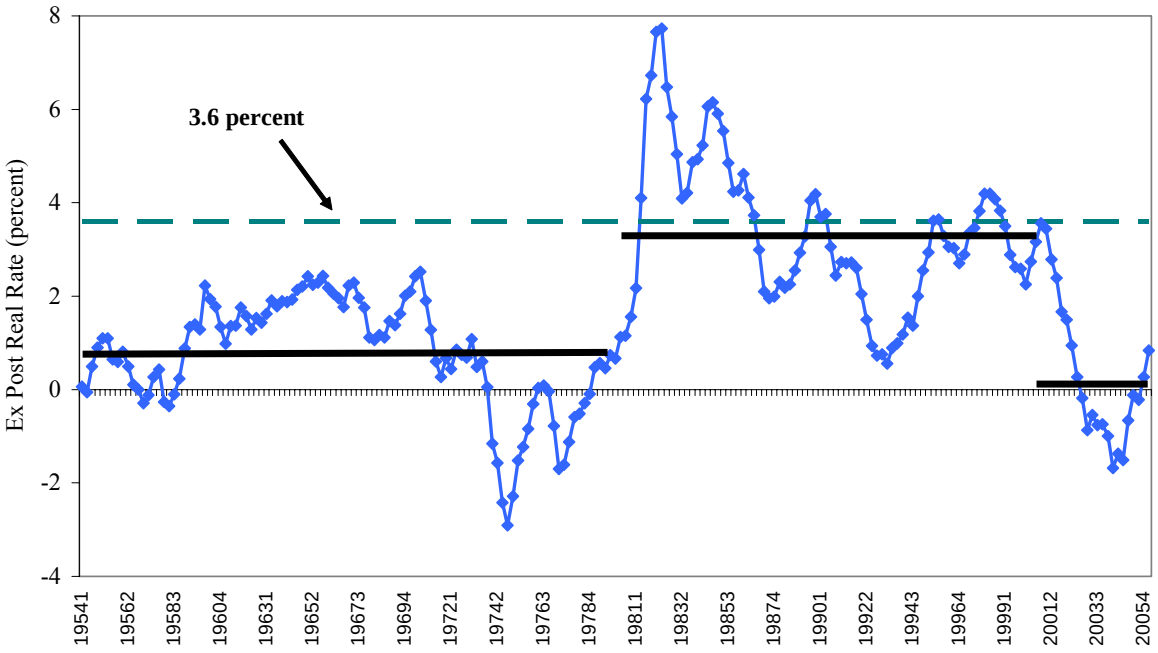


Figure 7: *Ex Post* Real Rates on 10-Year Treasuries
(Inflation after 2006 Assumed Equal to 2 Percent)

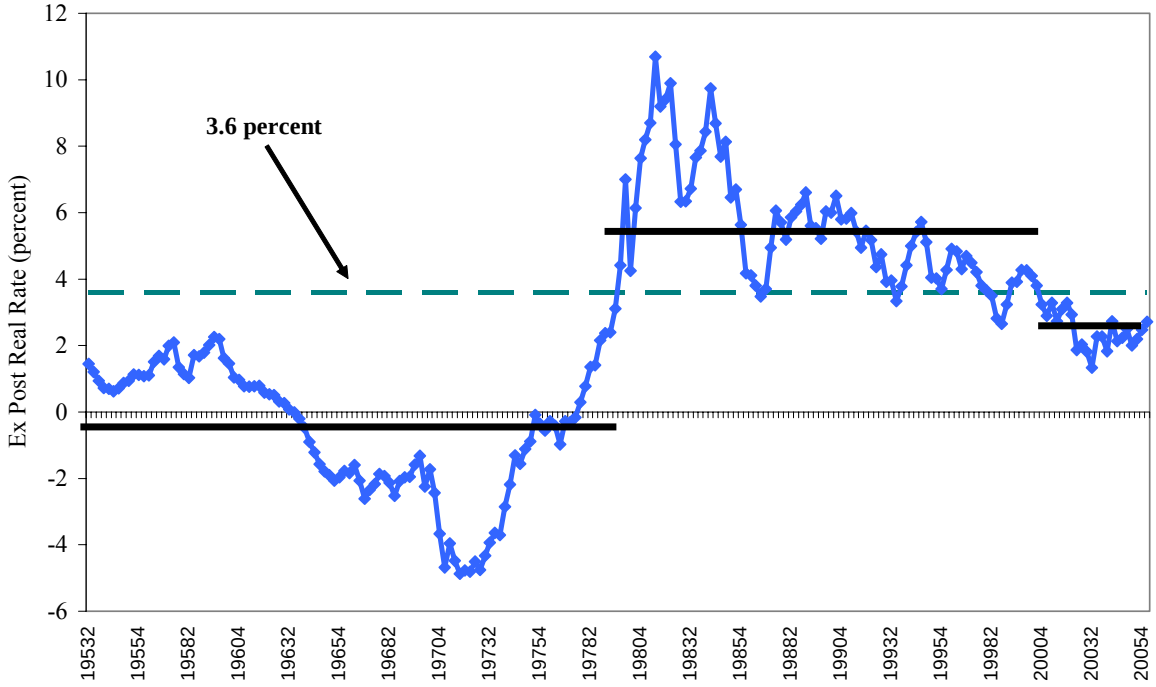


Figure 8: Nominal Treasury Rates Less Nominal GDP Growth Rate
(2-Year Moving Average)

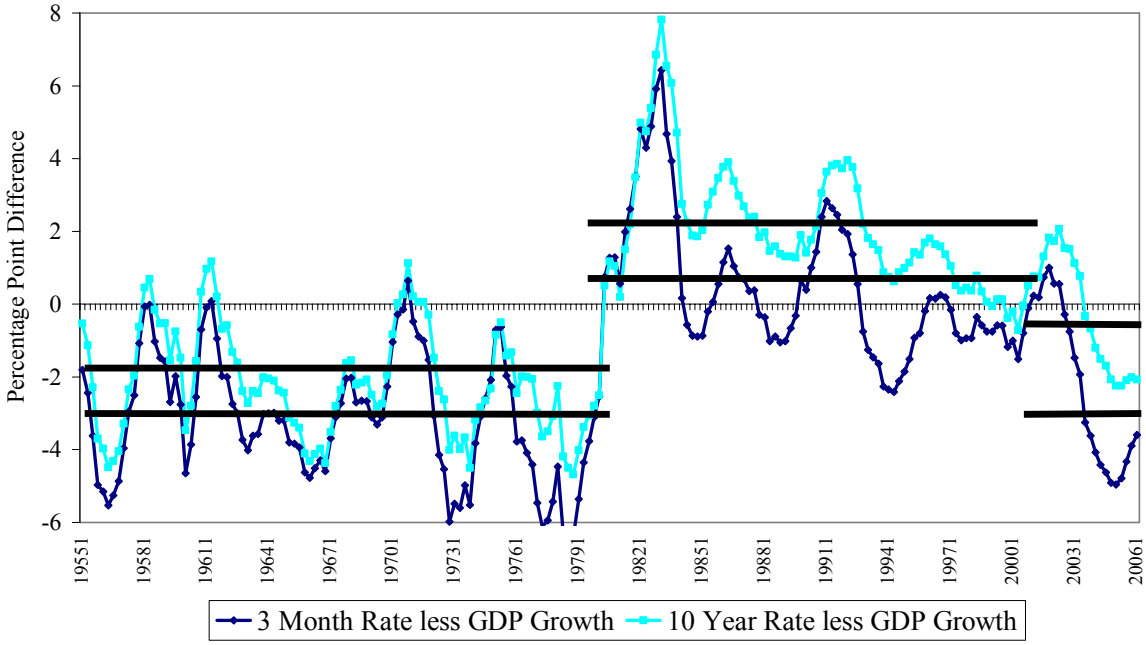


Figure 9: Federal Interest Outlays as a Percent of GDP

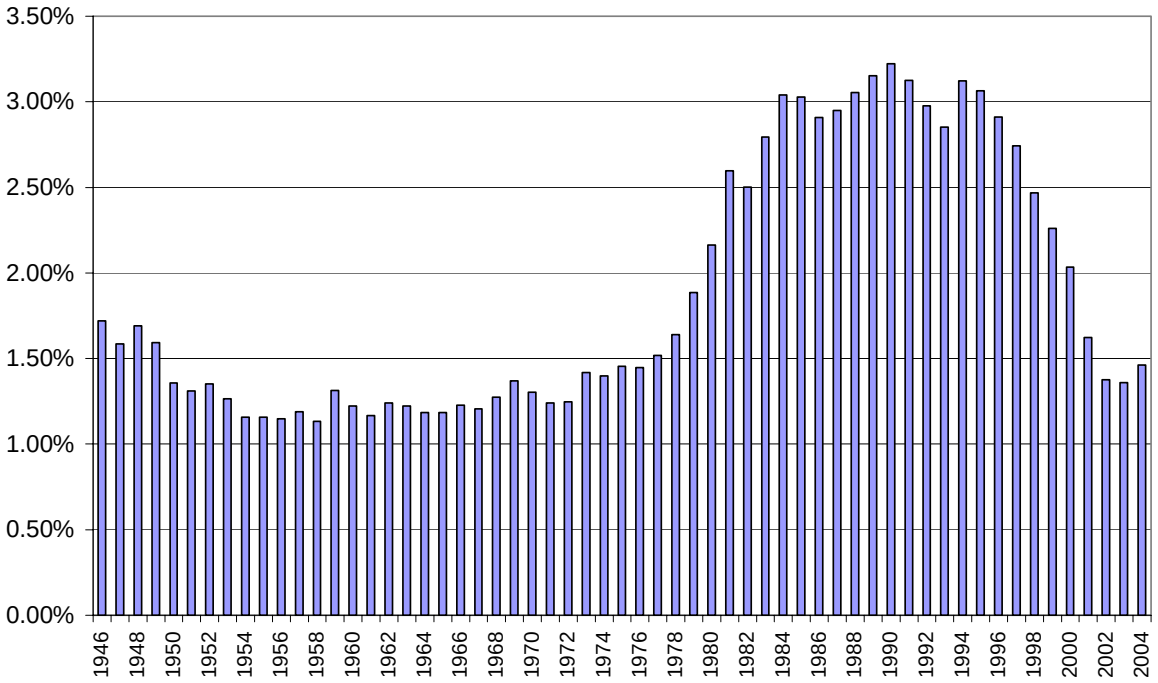


Figure 10: Financial Balances in the Government and Non-Government Domestic Sectors