Economic Effects of Sustained Budget Deficits

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ABSTRACT

The effects of fiscal policy on the economy have received substantial attention in academic and policy circles. We review this literature in light of recent policy debates and new research and obtain three results. First, other things equal, deficits reduce national saving and future national income, even if international capital inflows avert an increase in interest rates. Second, the recent fiscal deterioration implies significant declines in future national income. Third, studies incorporating the best available information about expected future deficits tend to find significant effects of expected deficits on current long-term bond yields, controlling for other factors.

I. Introduction

The effect of fiscal policy on the economy is a controversial and long-standing issue. It is at the heart of the policy debate surrounding the sharp increases in official federal budget surpluses in the 1990s, the even more dramatic decline in the fiscal outlook since January 2001, and the explosive future budget shortfalls associated with the increasingly imminent retirement of the baby boom generation. This paper re-evaluates the effects of sustained budget deficits on the economy in light of recent events and new research. Because several excellent reviews of the academic research on this topic already exist (Barth et al 1991, Bernheim 1987, Elmendorf and Mankiw 1999, Seater 1992), our presentation focuses on specific themes and interpretation of recent events.

The key economic issues hinge on the impact of deficits on national saving and the growth of future national income and living standards. The basic causal chain is straightforward. A large body of direct and indirect evidence indicates that, holding other factors constant, sustained deficits tend to reduce national saving. Given standard national accounting identities, the reduction in national saving must be matched by a reduction in domestic investment and/or a reduction in net foreign investment. In either case, the capital owned by Americans declines, which in turn reduces future national income and future living standards (relative to their level in the absence of the deficit).

Several aspects of this simple but robust chain of events are worth elaborating. First, deficits reduce future national income regardless of whether interest rates rise. This finding shows that the effect of fiscal policy on national saving and future national income is the central issue, and makes the more common debate about how deficits affect interest rates something of a sideshow. Second, deficits reduce future national income regardless of whether enough foreign capital flows in to the country to maintain the domestic capital stock at whatever level would have

otherwise obtained. If capital inflows were sufficient to keep the domestic capital stock constant, the only implication would be that domestic production would remain constant; Americans' claims on that production would still decline, because of the mortgage on Americans' future income created by increased borrowing from abroad. Third, plausible parameterizations imply that the recent fiscal deterioration implies substantial declines in future national income. A standard model indicates that the decline in the budget outlook that occurred between January 2001 and March 2003 will reduce national income in 2012 by $2,300 per household, other things equal.

How deficits affect interest rates is less important and more controversial than the impact on national saving and economic growth. Nevertheless, we show that studies incorporating the best available information about expected *future* deficits tend to find an economically and statistically significant effect of expected deficits on current bond yields, controlling for other factors. A rough range from this literature is that a sustained 1 percent of GDP rise in projected deficits would raise current yields by between 20 and 60 basis points, holding other factors constant. By any of a number of measures, this is a significant quantitative reaction.

Beyond their direct effect on national saving and interest rates, sustained budget deficits can also generate broader, albeit perhaps less tangible, costs. Uncertainty about how future deficits will be resolved could hamper long-term economic performance, above and beyond the direct effects of deficits delineated above. Ultimately, the U.S. role as the world's economic leader may also be threatened by systemic fiscal shortfalls.

Deficits can boost the economy in the short run for the same reason they constrain the economy in the long run: they reduce national saving, i.e., increase aggregate demand. In a slack economy, a short-term boost to aggregate demand can improve economic prospects by encouraging people to spend more and firms to use more of their existing capacity. Over the long

term, however, a key to raising future national income is higher national saving and national investment, which deficits inhibit.

All of the conclusions noted above hold other factors constant in analyzing the deficit. However, a complete policy analysis should take into account the direct effects of the change in spending or taxes that generate the deficit, as well as the indirect effects of the associated changes in the deficit. Thus, the conclusions above do not imply that any deficit-creating policy is harmful, just that the impact of deficits is likely to be an important component of the overall effects from a policy shift that is not revenue-neutral. Reductions in marginal tax rates, for example, may spur supply-side responses that raise growth at the same time that the deficits created by the tax cuts would reduce growth. The net effect is ambiguous in theory and depends on the structure and magnitude of the tax cut.

Section II provides background on the budget outlook and recent policy debates. Section III provides a framework for considering the impact of deficits on the economy. Sections IV and V review evidence on the impact of deficits on national saving, net foreign investment and interest rates. Section VI concludes.

II. Background

The effects of budget deficits are salient in part because of the scale of the long-term budget problems facing the nation. Figure 1 shows projected budget shortfalls over the next 75 years, under one set of estimates of what constitutes a plausible definition of current policy toward outlays and revenues.[1] The aging of the baby boomers, lengthening life spans, and rising health

[1] These assumptions are described and justified in Auerbach, Gale, Orszag, and Potter (2003) and Auerbach, Gale, and Orszag (2003). Between 2004 and 2013, the projections adjust the Congressional Budget Office baseline to extend all expiring tax provisions, raise the alternative minimum tax (AMT) exemption to keep about 3 percent of taxpayers on the AMT, and allow discretionary spending to rise with inflation and the population. After the first decade, Social

care costs generally will place increasing pressure on the Federal budget in years to come.

To evaluate the implications of these projections for the budget as a whole, analysts estimate a "fiscal gap." The fiscal gap reflects the size of the immediate and permanent increase in taxes or reductions in non-interest expenditures that would be required to maintain the long-run ratio of government debt to GDP at its current level.[2] The same set of policies that generate the deficit projections in Figure 1 also imply a fiscal gap of 4.5 percent of GDP through 2075 and 7.5 percent of GDP on an indefinite basis (Auerbach, Gale, and Orszag 2003). Although the precise size is uncertain, the existence of a long-term budget problem is not. Several studies suggest that even under optimistic scenarios, serious long-term fiscal problems will remain and under less optimistic scenarios long-term fiscal problems could be substantially worse.[3]

These projections were easy for policy-makers to ignore when the government was running large cash-flow surpluses for a few years in the late 1990s. The unified federal budget ran a deficit of 4.7 percent of GDP in 1992, first showed a surplus in 1998, and peaked at a surplus of 2.4 percent of GDP in 2000 before declining rapidly to an estimated deficit of 4 percent of GDP in 2003 (CBO 2003a, 2003b). The CBO's projected unified budget baseline for 2002 through 2011 deteriorated from a surplus of $5.6 trillion in January 2001 to a deficit of almost $400 billion in March 2003. The declines in the short-term deficits are primarily due to worsening economic conditions, which account for most of the decline in 2002 and 2003. The longer-term changes are due as much to the series of tax cuts that have been enacted since 2001 as to economic and

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Security and Medicare expenditures follow the 2003 intermediate actuarial projections, Medicaid grows at a rate determined by population and per capita health care spending, interest payments are determined endogenously by debt accruals. Taxes and all other spending grow with GDP.

[2] Over an infinite planning horizon, this requirement is equivalent to assuming that the debt-GDP ratio does not explode (Auerbach 1994).

[3] See CBO (2001), Lee and Edwards (2001), and Shoven (2002).

technical changes (CBO 2003a, Gale and Orszag 2003a).

At the same time that the fiscal outlook was deteriorating, the Bush Administration's Fiscal Year 2004 Budget (released in January 2003) proposed to make the 2001 tax cuts permanent, enact new tax cuts, and raise spending. Making the 2001 tax cuts permanent would cost between 1.5 percent and 1.9 percent of GDP on a permanent basis. This is more than twice the cost of shoring up the cost of social security over the next 75 years, 0.7 percent of GDP, and about equal to the cost of fixing social security permanently.[4] Thus, current and recent tax policy debates have significant implications for long-term fiscal policy issues (Gale and Orszag 2003b, c).

During this period, as current deficits rose, the long-term fiscal outlook picture became more salient, and the Bush Administration continued to push for additional tax cuts, advocates for those additional tax cuts made increasingly strident claims about the effects of budget deficits. Economist Kevin Hassett (2001) testified in Congress that "almost every recent study that has been published on this topic has failed to find any link between moderate increases in deficits and rises in interest rates."[5] R. Glenn Hubbard, then the Chair of President Bush's Council of Economic Advisers (CEA), noted that "I don't buy that there's a link between swings in the budget deficit of the size we see in the United States and interest rates…There's just no evidence."[6] The *Wall Street Journal* (2002) went so far as to claim that "The notion that deficits cause interest rates to rise is a fiction first argued by Robert Rubin, President Clinton's Treasury Secretary. There wasn't any

[4] See Auerbach, Gale, and Orszag (2002) and Auerbach, Gale, Orszag, and Potter (2003). The range depends on how the interaction between the tax cut and the alternative minimum tax (AMT) is treated. The tax cut exacerbates the cost of addressing the looming AMT problem, as discussed in Gale and Potter (2002). If the additional AMT costs attributable to the 2001 tax cut are counted as a cost of the tax cut, the effect of removing the sunset is 1.9 percent of GDP. If the AMT effects are ignored, the cost of removing the sunset is 1.5 percent of GDP.

[5] See Calomiris and Hassett (2002, p. 120) for a similar statement.

[6] Stevenson (2002). See also Hubbard (2001a, 2001b, 2002a, 2002b, 2002c, 2002d, 2002f), Andrews (2002), and Pearlstein (2002).

empirical evidence to support this argument when Mr. Rubin trotted it out, and there still isn't." Each of these claims is demonstrably false. Moreover, all of them miss the key point that the principal impact of deficits is on national saving and hence future national income.

Much of the less sensible public discussion quieted down, however, after Federal Reserve Board Chairman Alan Greenspan (2003) testified that "Contrary to what some have said, it [the budget deficit] does affect long-term interest rates and it does have an impact on the economy."[7] In the 2003 Economic Report of the President, the CEA provided calculations that imply that an increase in the deficit of 1 percent of GDP over the next 10 years would raise interest rates by 22 basis points.[8] After Hubbard resigned and Gregory Mankiw was named the acting Chair, the CEA reported that a 1 percent of GDP increase in sustained deficits would raise interest rates by about 30 basis points (Wall Street Journal 2003).

III. How Deficits Affect the Economy

A. Framework[9]

To gain insight into the economic effects of budget surpluses or deficits in the long term, it is helpful to employ some basic macroeconomic building blocks. National saving is the sum of private saving (which occurs when the private sector spends less than its after-tax income) and public saving (which occurs when the public sector runs budget surpluses). National saving finances either domestic investment (the accumulation by Americans of assets at home) or net

[7] Andrews (2003).

[8] The CEA (2003, p. 58) notes that "a conservative rule of thumb based on this relationship is that interest rates rise by 3 basis points for every additional $200 billion in government debt." GDP is projected to total to $144 trillion between 2004 and 2013 (CBO 2003). A 1 percent of GDP increase in the deficit overt the next 10 years would therefore raise rates by 22 basis points.

[9] This subsection is based substantially on Elmendorf and Mankiw (1999).

foreign investment (the net accumulation by Americans of assets abroad).[10] Either way, that accumulation of assets means that the capital stock owned by Americans is increased. The returns to those additional assets raise the income of Americans in the future.[11] These building blocks highlight two key aspects of deficits, holding other factors constant:

- An increase in the budget deficit (a decline in public saving) reduces national saving unless it is fully offset by an increase in private saving.

- A reduction in national saving must correspond to a reduction in national investment and in future national income.

Because national saving (S) must equal the sum of domestic investment (I) and net foreign investment (NFI), the only issue is how the elements of that identity come back into alignment following a decline in national saving. The possibilities are limited: either domestic investment falls and/or net foreign investment falls, as shown in equation (1):

$$\Delta S = \Delta I + \Delta NFI. \quad (1)$$

[10] Net foreign investment is the difference between what Americans invest overseas and what foreigners invest in the United States. A decline in net foreign investment take the form of reduced overseas investments by Americans, increased borrowing from overseas by Americans, or increased investment in the United States by foreigners. Declines in net foreign investment also correspond to a decline in the current account, defined as net exports of goods and services plus net factor payments from abroad plus net unilateral transfers.

[11] Elmendorf and Mankiw (1999, page 1637) note that "As long as the returns to wealth are the same at home and abroad, the location of the ...[change in] wealth does not affect our income… Tomorrow's national output and income depend on today's national saving, wherever this saving is ultimately invested." They also note several caveats to this statement, including differential tax implications of investment abroad relative to investment at home and income distributional implications.

These changes in investment quantities can occur with different combinations of changes in prices (interest rates and exchange rates). Various scenarios are summarized in Figure 2 and described here. In these scenarios, we assume the deficit is created by a lump sum tax cut.[12]

The key issue is the response of private saving to a change in the deficit.[13] If private saving rises by the same amount as government saving falls (i.e., by the same amount as the deficit rises), then there is no change in national saving and no further adjustments would be required or expected. This is the Ricardian equivalence hypothesis advanced by Barro (1974).

If private saving rises by less than the full amount that public saving falls, then national saving falls and further adjustments are required to bring national saving and national investment back into balance. If private saving does not fully offset the change in public saving, but the flow of capital from overseas is infinitely elastic, the entire quantity adjustment occurs through higher capital inflows ($\Delta S = \Delta NFI$). Net foreign investment declines in this case, but the domestic capital stock remains constant ($\Delta I = 0$). Because the domestic capital stock remains the same, domestic output is constant. However, Americans' claims on that output decline because the increased borrowing from abroad (i.e., increased capital inflow) must be repaid in the future. Those repayments effectively create a mortgage against future national income. Because the capital inflow in this example is assumed to be infinitely elastic, interest rates do not change, but the dollar rises in value in response to increased demand for dollar-denominated investments. Notably, even though interest rates do not change in this scenario, higher deficits still reduce future

[12] This clarifies the experiment in at least two ways. First, the Ricardian Equivalence view (Barro 1974) applies to changes in the timing of taxes, holding marginal tax rates and the government expenditure path constant. Second, changes in government spending will induce changes in private spending, independent of any effect on the deficit, when private and public spending are substitutes.

[13] The effects described in the text, in response to a change in the deficit, would occur simultaneously. Our ordering of the discussion is intended merely to provide a way of thinking about the channels through which deficits affect the economy. It does not imply or require that the particular changes discussed occur in some particular order over time.

national income. We refer to this scenario as the perfect capital mobility view.

Alternatively, if the supply of capital were not infinitely elastic, the relative price and quantity adjustments differ following a rise in the deficit, but the end result -- a decline in future national income -- remains the same. In the absence of perfect capital mobility, the reduction in national saving implies a shortage of funds to finance investments given existing interest rates and exchange rates. That imbalance puts upward pressure on interest rates as firms compete for the limited pool of funds to finance investments. The increase in interest rates serves to reduce domestic investment ($\Delta I<0$). In a closed economy, the entire adjustment to the reduction in national saving occurs through domestic investment ($\Delta I = \Delta S$). In an open economy with imperfect capital mobility, the decline in national saving and the resulting rise in interest rates induces some combination of a decline in domestic investment and a decline in net foreign investment (i.e., increases in capital inflows), the latter of which would also bid up the exchange rate. These changes must be sufficient to ensure that the change in national investment equals the change in national saving. We refer to this scenario as the conventional view.

B. Are the effects of deficits economically significant?

None of these considerations would matter in practical terms if the effects of deficits were insignificant. But some basic conceptual calculations show that variation in projected budget outcomes of the kind seen in recent years can easily have significant effects on output and interest rates. For example, as noted earlier, the Congressional Budget Office baseline projections for the 2002-2011 period deteriorated by $6 trillion from January 2001 to March 2003. That increase reflects the cumulative deterioration in federal government saving between 2001 and 2011 under the official forecasts.

Based on estimates discussed below, we assume that 25 percent of the deterioration in

government saving is offset by increased private saving, which implies that the budget shift reduces the stock of net assets owned by Americans at the end of 2011 by $4.5 trillion (= 75 percent * $6 trillion). Assuming that this capital earns a pre-tax return of 6 percent implies a reduction in national income of $270 billion (=0.06*$4.5 trillion) in 2012.[14] This translates into an average decline in income in that year of more than $2,300 per household.[15] If one-third of the decline in national saving is offset by capital inflows, gross domestic product would decline by about $180 billion, or about 1 percent relative to its projected level in 2012 (CBO 2003a). Notably, the effect of deficits on national income and GDP would persist (and grow) over time.[16]

It is also possible to gauge the interest rate effects of the recent fiscal shift. Ball and Mankiw (1995) model an economy with a Cobb-Douglas production function and find that a reduction in government debt equal to 50 percent of GDP would reduce real interest rates by 170 basis points. The recent $6 trillion shift in projected fiscal status for 2002-2011 represents more than one-third of projected GDP in 2012. Thus, the Ball and Mankiw results suggest that the fiscal deterioration will raise real rates by at least 112 basis points (=33/50*170).[17]

C. Broader costs of deficits

Beyond their direct effect on national saving, future national income, and interest rates,

[14] Poterba (1998) estimates a pre-tax marginal product of capital of 8.5 percent for nonfinancial corporate capital, which is taxed at a higher rate than other capital and hence should be expected to have a higher pre-tax marginal product than other capital. Elmendorf and Mankiw (1999) suggest 6 percent for the return on aggregate capital.

[15] The Census Bureau projects the number of households at 114.2 million in 2010. Assuming a growth rate of 1.05 percent per year after 2010, roughly the average over the prior three years, the number of households will reach 116.6 million in 2012. See http://www.census.gov/population/projections/nation/hh-fam/table1n.txt.

[16] The decline in national saving is $4.5 trillion. With one-third of that amount offset by capital inflows, the domestic capital stock would fall by $3 trillion, implying a reduction in gross domestic product of $180 billion in 2012. CBO (2003a) projects 2012 GDP to be just over $17 trillion.

[17] This model of interest-rate determination is helpful, but has some important shortcomings. For example, it is unclear whether the model examines short- or long-term rates. In addition, by focusing on how the capital stock changes, the model does not incorporate the effects on interest rates from anticipated future changes in the capital

deficits can affect the economy in other ways as well. The presence of sustained and growing budget deficits, as shown in Figure 1, implies the need for corrective action. Uncertainty about the timing, extent, and structure of such actions could eventually "spook" financial markets and undermine confidence in the government's ability to meet its obligations.

The uncertainty associated with long-term fiscal deficits betrays arguments that tax or spending provisions that increase the long-term deficit -- such as making the 2001 tax cut "permanent" -- would reduce uncertainty. Indeed, making such provisions permanent could actually increase uncertainty, because individuals would not know how the deterioration in the long-term budget outlook associated with the provisions will ultimately be resolved. The key point is that uncertainty is not eliminated, and may well be increased, by enacting legislation that is clearly unsustainable.

Increased budget deficits and current account deficits may also entail other costs, as investors lose confidence in U.S. economic leadership. As Truman (2001) emphasizes, a substantial fiscal deterioration over the longer-term may cause "a loss of confidence in the orientation of US economic policies and a further widening of the current account deficit. In my view, this is the principal international risk with respect to paying down Treasury debt: our failure to do so will undermine the strength of the US economy and confidence in US economic and financial policies." Such a loss in confidence could then put upward pressure on domestic interest rates, as investors demand a higher "risk premium" on U.S. assets.

The costs of persistent current account deficits -- which are induced by the imbalance between national saving and national investment -- may extend beyond narrow economic ones. Friedman (1988) notes that "World power and influence have historically accrued to creditor

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stock; that is, it ignores the existence of forward-looking behavior by market participants, and thus underestimates the impact of permanent tax changes on interest rates.

countries. It is not coincidental that America emerged as a world power simultaneously with our transition from a debtor nation…to a creditor supplying investment capital to the rest of the world."

D. Deficits over different time horizons

Deficits can have favorable effects on economic performance in the short run even though they have unfavorable effects in the long term. The difference is not in how deficits affect the economy. In both the short run and the long run, deficits reduce national saving and therefore increase aggregate demand. Instead, the difference arises because of potentially differing economic situations over different horizons. In the long run, the typical assumption is that the economy fully employs existing labor and capital. Under those circumstances, the only way to raise economic growth is to expand the economy's capacity to produce income at home and abroad. By reducing national saving, deficits hinder that ability. Over shorter horizons, the economy is sometimes well below full employment of labor and capital. Under those circumstances, a rise in the deficit can provide a welcome boost to aggregate demand and encourage increased use of existing labor and capital, giving the economy a short-term boost.

E. Effects of policies that create deficits

The analysis above considers only the effects of reduced budget surpluses or increased budget deficits *per se*. It establishes the crucial observation that, other things equal, larger deficits reduce national saving and hence future national income relative to what it would otherwise be, and that this effect holds even if interest rates do not rise.

But everything else is not equal, and a full analysis of the effects of reducing surpluses or increasing deficits should take into account the direct effects of the spending programs or tax reductions financed by the reduction in the surplus as well as the effect of the resulting deficit on

the economy. For example, spending $1 on public investment projects would reduce the unified budget surplus by $1, but the net effect on future income would depend on whether the return on the public investment project exceeded the return on the private capital that would have instead been financed by the national saving associated with the surplus.

Similarly, a significant share of the recent deterioration in the budget outlook reflects reductions in marginal tax rates that, it could be argued, will boost economic output. Given the structure of the 2001 tax cut, however, researchers have generally found that the positive effects on future output from the impact of reduced marginal tax rates on labor supply, human capital accumulation, private saving and investment are outweighed by the negative effects of the tax cuts via reduced public and national saving. Gale and Potter (2002) estimate that the 2001 tax cut will have little or no net effect on GDP over the next 10 years and could even reduce it, and that GNP is likely to fall; that is, they find that the negative effect of the decline in national saving outweighs the positive effect of reduced marginal tax rates. Elmendorf and Reifschneider (2002) use a large-scale econometric model developed at the Federal Reserve and find that a reduction in taxes that appears somewhat similar to the personal income tax cuts in the 2001 law reduces long-term output and has only a slight positive effect on output in the first 10 years. Auerbach (2002) estimates that the 2001 tax cut will reduce the long-term size of the economy unless it is financed entirely by spending reductions -- that is, unless it has no net effect on the surplus or deficit. CBO (2001b) concludes that the 2001 tax legislation may raise or reduce the size of the economy, but the net effect is likely to be less than 0.5 percent of GDP in either direction in 2011, again depending primarily on the effects on national saving. Likewise, macroeconomic analysis of the 2003 capital tax cuts suggests that the net long-term growth effects are negative -- that is, that the negative effects of deficits on capital accumulation outweigh the positive incentive effects of such

policies (Joint Committee on Taxation 2003, Macroeconomic Advisers 2003).

IV. Deficits, National Saving, and Capital Flows

A. Evaluating the Evidence

The framework discussed above and summarized in Figure 2 generates several useful implications for evaluating the empirical effects of budget deficits. Most notably, the discussion shows that *something* has to change in response to the deficit.

Under the Ricardian equivalence view, private saving rises by the full amount of the decline in government saving and everything else remains constant. Thus, a finding that private saving rises by less than the full amount of the rise in the deficit (i.e., a finding that deficits affect private consumption) is evidence against the Ricardian view. Likewise, evidence that deficits affect anything else -- including domestic investment, net foreign investment, exchange rates or interest rates -- constitutes evidence against the Ricardian view.[18]

Under the perfect capital mobility view and the conventional view, national saving falls when the deficit increases; that is, private saving may rise in response to a deficit, but by less than the increase in the deficit. As a result, deficits must create a reduction in the sum of domestic and net foreign investment. The mechanism for generating those reductions, in turn, involves either a rise in interest rates and/or exchange rates.[19] The perfect capital mobility view implies that all of the adjustment occurs through net foreign investment and exchange rates. Domestic investment and interest rates remain constant. As a result, under the perfect capital mobility view, GDP does not change, but GNP (national income) declines. Under the conventional view, GDP does fall, due to a combination of declines in both net foreign investment and domestic investment, and

[18] As above, we are technically assuming that the deficits arise from a lump-sum tax cut.

[19] An increase in the exchange rate is an appreciation of the domestic currency relative to foreign currencies.

increases in exchange rates and interest rates.

Taken as a whole, these models generate a variety of interesting tests. The key test, or course, is whether private saving rises by the full amount of the decline in government saving. *In the absence of a full private saving offset*, several conclusions follow:

- An empirical finding that deficits do not influence exchange rates (ruling out the perfect capital market mobility view) implies that they must affect interest rates (as required by the conventional view).

- A finding that deficits have no effect on interest rates (ruling out the conventional view) implies that they must affect exchange rates (as required by the perfect mobility view).

- A finding that net foreign investment or the current account does not respond to deficits (ruling out the capital mobility view) implies that domestic investment must decline by the full amount of the change in national saving (consistent with, but not required by, the conventional view).

These relations are crucial for evaluating the empirical effects of deficits. For a number of well-known reasons, the effects of deficits are difficult to pin down statistically, but the theory shows that the effects have to appear somewhere.[20] Thus, the right criterion for evaluating the empirical literature is not which effects of deficits have been proven conclusively, but which

[20] A short list of such issues includes the appropriate definition of the deficit (including adjustments for inflation, interest rates, the business cycle, contingent liabilities, government assets and so on); the difficulty of distinguishing expected and unexpected changes in the deficit and other variables; the potential endogeneity of many of the key explanatory variables; the correct specification of income, taxes, and spending; and the time series properties of the variables used. For extensive discussion, see Bernheim (1987), Elmendorf and Mankiw (1999), and Seater (1992).

effects have been shown to be more robust than others. For the most part, we summarize findings obtained in earlier surveys (Barth et al 1991, Bernheim 1987, Elmendorf and Mankiw 1999, Seater 1992) and focus our discussion on research completed in the last decade.

B. Effects on Private and National Saving

Barro (1974) demonstrates that under a certain set of conditions a reduction in taxes today in exchange for future tax increases of equal present value would leave current consumption unchanged. This would occur if: households are fully rational and foresighted; households are altruistic, in that they derive utility from the utility of their heirs;[21] households do not face liquidity constraints; the taxes in question are lump-sum taxes; and households do not save for precautionary reasons. Under these circumstances, households would recognize that the reduction in taxes today would increase future tax liabilities and thus would save the entire tax cut. As a result, private saving would rise by the decline in public saving.

Substantial indirect evidence implies that consumers violate the dictates of the Ricardian model. Households face borrowing constraints and distortionary taxes, they are not purely altruistic, their behavior violates perfect rationality in numerous ways; and they do save for precautionary reasons. A variety of stylized findings appear to reject the notion that households have infinite horizons: wealth levels are low for many households, consumers respond to temporary tax cuts, and many decedents make no bequests. All of these findings raise suspicions about the validity of Ricardian Equivalence, but none of them indicate the extent of any possible violation of the model. It is the extent to which the data patterns quantitatively differ from the implications of Ricardian theory that matters for understanding the impact of sustained deficits.

[21] In addition to requiring that households be altruistic, Barro's neutrality theory requires that households are equally altruistic -- that is, that they have the same preference for their heirs relative to their own consumption. See Elmendorf and Mankiw (1999) for further discussion.

The academic literature on the effects of deficits on national saving (or equivalently, on private saving or on consumption) is immense and complex. We focus on a few key highlights from the literature and refer the reader to the surveys mentioned above for details. Controlling for other factors, most studies find that $1 increase in the deficit caused by a $1 reduction in taxes raises short-run consumption (and therefore reduces national saving) by a significant fraction of the change in the deficit. That is, the marginal propensity to consume out of deficits is substantially higher than zero. A few studies (notably Kormendi 1983 and Seater and Mariano 1985) find small or non-existent effects. Those studies, however, either obtain large standard errors on the coefficients, prohibiting them from rejecting a wide range of interesting hypotheses, and/or they have collateral implications that either reject Ricardian equivalence or imply nonsensical results.[22] In the long run, one would expect the share that is consumed to rise, with a concomitant drop in the share saved.

The Congressional Budget Office (1998c) concluded that private saving would rise by between 20 to 50 percent of an increase in the deficit. This estimate incorporates the indirect effect of budget shifts on private saving through interest rates. Elmendorf and Liebman (2000) conclude that private saving would offset 25 percent of an increase in the deficit. Gale and Potter (2002) estimate that private saving will offset 31 percent of the decline in public saving caused by the 2001 tax cut.

Certainly, no individual study is conclusive on this issue, given the range of difficult statistical issues. Our interpretation is that the overwhelming preponderance of the evidence indicates that budget deficits reduce national saving and raise consumption.

[22] For example, Bernheim (1987) notes that the marginal propensity to consume out of long-run income is only 0.3 in Kormendi's model and suggests that this implies measurement error, misspecification or both. Seater (1992), in contrast, defends Kormendi's work as the best available study.

C. Effects on International Capital Flows

A second key question is how international capital flows respond to changes in national saving. The "perfect capital mobility view" states that the entire decline in national saving created by a deficit is financed by capital inflows. The "conventional view" states that some portion, ranging from zero (in a closed economy) to a share less than 100 percent, of the decline in national saving is financed by capital inflows. What is at stake in this difference is whether long-term gross domestic product remains constant (the perfect capital mobility view) or declines (the conventional view) with increases in the deficit.

Evidence suggests that although gross international capital flows are substantial, net flows are significantly smaller and capital markets appear to be somewhat segmented (Feldstein 1994, Gordon and Bovenberg 1996). Over the long-term, between 25 percent and 40 percent of changes in national saving tend to be offset by net international capital flows (CBO 1997, Dornbusch 1991, Feldstein and Bacchetta 1991, Feldstein and Horioka 1980, Obstfeld and Rogoff 2000). A reasonable point estimate would be that one-third of the decline in national saving is offset by capital inflows. This is inconsistent with the perfect capital mobility view and hence implies that long-term deficits can reduce GDP as well as national income.[23]

V. Deficits and Interest Rates

Previous analyses reach widely varying conclusions about the effects of deficits on interest

[23] The perfect mobility view implies that deficits affect exchange rates. Under the conventional view, deficits can, but do not have to, affect exchange rates. The literature on exchange rates suggests a wide range of effects -- see for example Evans (1986) and Feldstein (1986b). This literature, as a result, is not helpful in distinguishing the two views. A related literature examines the impact of deficits on the current account, the flip side of capital inflows. Here, the issue is whether the current account responds to the deficit. Given that deficits reduce national saving, an additional finding that deficits do not affect the current account implies that they do not affect capital inflows and would therefore constitute strong evidence against the "perfect mobility view." For evidence that U.S. trade deficits grow in response to higher deficits, see Bernheim (1988) and Rosensweig and Tallman (1993).

rates. For example, Barth et. al (1991) surveys 42 studies through 1989, of which 17 found a "predominately significant, positive" effect of deficits on interest rates (that is, larger deficits raised interest rates); 6 found mixed effects; and 19 found "predominately insignificant or negative" effects.[24] The variability may not be surprising, given the statistical obstacles detailed earlier. But even by the most generous standard, it is inaccurate to assert there is "no evidence" that deficits affect interest rates. A more accurate statement would be that, taken at face value, the evidence from the empirical literature is mixed.[25]

It is worth noting that this literature examines the coefficient on deficits in a regression explaining interest rates. The reason this seemingly obvious point is worth noting is that it has been obscured by economists in public discussion. In response to questions about whether deficits matter, President Bush's Chairman of the Council of Economic Advisers frequently noted that "deficits and interest rates do not move in lockstep."[26] This statement is entirely irrelevant to debates about the effects of budget deficits. To our knowledge, no one ever claimed that a regression of interest rates on deficits, without controlling for other factors, would yield a high R-squared, which is presumably what is meant by having the two "move in lockstep." Nevertheless, if the coefficient on interest rates were economically and statistically significant, after controlling

[24] Barth et al (1991) conclude that "Since the available evidence on the effects of deficits is mixed, one cannot say with complete confidence that budget deficits raise interest rates…But, equally important, one cannot say that they do not have these effects. Other reviewers of the literature have reached similar conclusions. Elmendorf and Mankiw (1999) note that "Our view is that this literature...is not very informative." Bernheim (1989) writes that "it is easy to cite a large number of studies that support any conceivable position."

[25] Almost all major macroeconometric models imply an economically significant connection between changes in budget deficits and in long-term interest rates. The precise effects depend on a wide variety of factors, including whether the change in the deficit is caused by a change in taxes or a change in spending, how monetary policy reacts, and how foreign governments react. The results vary widely, in part because different policies are simulated and standardization is difficult, but the findings suggest that a sustained increase in the primary (non-interest) deficit of 1 percent of GDP would raise interest rates by 40-50 basis points after 1 year and 50-100 basis points after 10 years (See Gale and Orszag 2002).

[26] Hubbard (2002f, 2003).

for other factors, then deficits influence interest rates regardless of whether the two series move in lockstep.

A. The Role of Anticipated Deficits

Our contribution to interpreting this literature is to highlight the key role of using accurate information on expected deficits. As Feldstein (1986a) has written, "it is wrong to relate the rate of interest to the concurrent budget deficit without taking into account the anticipated future deficits. It is significant that almost none of the past empirical analyses of the effect of deficits on interest rates makes any attempt to include a measure of expected future deficits." Since financial markets are forward-looking, excluding deficit expectations could bias the analysis toward finding no relationship between interest rates and deficits.[27]

Studies that incorporate more accurate information on expectations of *future* deficits tend to find economically and statistically significant connections between anticipated deficits and current interest rates. Table 1 combines all of the papers reviewed in Barth et. al. (1991) with papers that we have discovered written since then. Of the 18 papers incorporating timely information on projected deficits, 13 find predominantly positive, significant effects between anticipated deficits and current interest rates, 4 find mixed effects, and only one finds no effects. This is a striking result, given the econometric obstacles noted above. 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 auto-regression.[28]

[27]Bernheim (1987) notes that if households perfectly anticipated future deficits, one may well find no empirical relationship between the current deficits and interest rates, even though the path of interest rates and economic activity would be substantially different in the absence of the deficits.

[28] Another factor affecting whether a study finds a significant effect is whether it (properly) includes both long-term interest rates and short-term rates rather than just the level of either. Bernheim (1987) emphasizes that expected future interest rates must be included in the analysis to properly identify the effects of deficits. To the extent that current long-term interest rates reflect expected future short-term interest rates, the exclusion of long-term interest rates could bias the results. Thus, including both long-term and short-term interest rates in an analysis, even if imperfect, is more

The challenge, of course, in incorporating market expectations about future deficits is that such expectations are not directly observable. Researchers have thus used different strategies in developing up-to-date measures of expected future deficits.

One approach is to use published forecasts of the deficit as a proxy for market expectations. Cohen and Garnier (1991) use OMB budget projections and find that an increase in the expected deficit of one percent of GNP raises the 10-year interest rate by 53 to 56 basis points. The increase is not statistically significant when the regression is undertaken using the 10-year interest rate itself as the dependent variable. The effect of the current deficit relative to projected levels is statistically significant when the spread between the 10-year interest rate and the one-year interest rate is used. The authors also find that increases in OECD projected deficits raise short-term interest rates for the G-7 as a whole.

Elmendorf (1993) uses deficit forecasts from Data Resources, Inc. and finds that an increase in the projected deficit of one percent of GNP raises five-year bond yields by 43 basis points. Canzoneri, Cumby, and Diba (2002) use CBO projected surpluses and find that an increase in projected future deficits averaging one percent of current GDP is with an increase in the long-term interest rate relative to the short-term interest rate of 53 to 60 basis points. Laubach (2003) uses CBO and OMB projections and finds that a one percentage point increase in the deficit-to-GDP ratio raises long-term interest rates by about 25 basis points.

A second approach involves "event analysis" of news reports about deficit reduction legislation or budget projections. This approach examines the change in interest rates (or other variables) on the day in which deficit news is released. Elmendorf (1996) examines financial market reactions to events surrounding passage of the Gramm-Rudman-Hollings legislation in

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likely to be insightful than an analysis that excludes either one. Barth et al (1991) note that studies that include both interest rates tend to find significant effects from deficits.

1985 and the Budget Enforcement Act of 1990. Based on analysis of financial market reactions to news about the prospects for those two pieces of deficit reduction legislation, Elmendorf concludes "higher expected government spending and budget deficits raised real interest rates…while lower expected spending and deficits reduced real rates" and that the relationship was statistically significant.[29]

Several other recent papers examine interest rate changes surrounding the release of new budget projections. Thorbecke (1993) uses OMB and CBO projections and finds that a $100 billion increase in the deficit (relative to the previously projected level) is associated with an immediate increase in 10-year interest rates of 14 to 26 basis points. Quigley and Porter-Hudak (1994) use CBO and OMB projections and find that a one-percent increase in the deficit itself (not as a percentage of GDP) raises short-term interest rates by 0.37 to 0.87 basis points. Assuming a baseline deficit of 2 percent of GDP implies that an increase in the deficit of one percent of GDP (a 50 percent increase in the deficit) would raise short-term interest rates by 18.5 to 43.5 basis points. They do not provide sufficient information to estimate the effects on long-term rates. Kitchen (1996) uses changes in OMB forecasts and finds a statistically significant but quite modest effect--an increase in the deficit projection of one percent of GDP raises 10-year bond yields by 3.4 basis points for one-year budget projections. He finds even smaller effects for multi-year budget projections on long-term interest rates.

B. Implications

The studies above suggest that, as a rough range, a sustained increase in the deficit equaling one percent of GDP would raise interest rates by between 20 and 60 basis points. It is useful to

[29] The Council of Economic Advisers (1994) similarly studies the events surrounding passage of the Omnibus Budget Reconciliation Act of 1993. CEA concludes that its event analysis "linking the announcement and enactment of credible budget reduction to changes in the long-term interest rate provides support for the view that the interest rate declines were largely due to budget policy.

obtain some perspectives on the magnitude of this effect. To do so, we assume that the correct figure is 30 basis points, matching the Council of Economic Advisers' most recent statement noted above (see Wall Street Journal 2003).

This assumption implies that the 2001 tax cut *raised* the cost of capital for investments in residential housing, sole proprietorships, and corporate structures, and reduced it only slightly for corporate equipment. That is, the tax cut reduced marginal tax rates, which reduced the cost of capital, but it also increased deficits, which raised interest rates and hence raised the cost of capital. Based on analysis in Gale and Potter (2002), the implied net effects raise the cost of capital assuming that a sustained deficit increase equal to 1 percent of GDP raises interest rates by 30 basis points.

A 30 basis point effect for each 1 percent of GDP in sustained deficits also implies that the $6 trillion decline in the official budget outlook since January 2001 raised long-term rates by about 120 basis points, since the fiscal deterioration represents about 4 percent of GDP over the next decade. This estimate is roughly consistent with the one generated by the Ball and Mankiw model noted above.

C. Vector Autoregressions

Several studies of deficits and interest rates use vector auto-regressions (VARs). A VAR involves multiple-equation regressions of several variables (the vector) on past values of each other (the auto-regression). For example, a researcher hoping to examine the interactions between deficits, interest rates and the money supply might regress each of those variables on lagged values of all three variables. The regressions are used to examine the underlying connections among the variables. Some of the most heavily cited papers finding no effect of deficits on interest rates,

including Evans (1987a) and Plosser (1982, 1987), employ VARs.[30]

A VAR can represent one method of projecting future deficits. In particular, the statistical relationships produced from the historical regressions can be used to forecast the underlying variables into the future. For example, based on the relationships that existed in the past, the current value of the interest rate, deficit, and money supply can be used to project the future deficit. That projected future deficit can then be used as a measure of the expected deficit.

The problem with this approach, as described in detail in Elmendorf (1993) and Bernheim (1987), is that the VAR is typically based on a very limited number of variables, ignores information not reflected in such variables, and assumes that the relationships among the variables do not change over time. For example, in 2002, a VAR-based projection of the future deficit would have ignored the scheduled reductions in tax rates and the elimination of the estate tax that were included in the 2001 tax legislation. In essence, the VAR projection is fundamentally backward-looking, and fails to incorporate information that may be widely available to market participants about future events. Elmendorf (1993), Bernheim (1987), and Cohen and Garnier (1991) all show that VAR-based projections are inferior to those produced by CBO, OMB, or DRI. The implication is that VAR-based projections are more likely to suffer from measurement error and thus to be biased toward showing no effects of deficits on interest rates.

Despite these limitations, several recent papers have applied the VAR methodology to examine the connection between deficits and interest rates. Some recent papers, including Perotti

[30] These are also some of the most heavily criticized studies, along the grounds that: the results are not robust to changes in sample period or specification; the results sometimes suggest negative effects of deficits on interest rates, which are difficult to explain theoretically; the models contain a variety of strong and unusual maintained assumptions; the equations explain only a small portion of the variance, which suggests either measurement error or that missing variables explain much of the residual and are being proxied by the variables in the regression; the tests have very little power, and in some cases are even unable to reject the hypothesis that expected inflation has no effect on nominal interest rates. For further discussion, see Bernheim (1987) and Elmendorf and Mankiw (1999).

(2002) and Mountford and Uhlig (2000), find either no effect or only a temporary effect on interest rates. Other VAR-based papers, however, do find significant effects of deficits on bond yields. Tavares and Valkanov (2001) examine returns on bonds *relative to* the return on 3-month Treasury bills, find a statistically and economically significant connection with fiscal policy shifts, and show that their results are robust to a variety of different specifications. Similarly, Canzoneri, Cumby, and Diba (2002) include both the Federal funds rate and the 10-year bond rate in a structural VAR; they find that the ten-year yield rises by 45 basis points immediately, and by roughly 40 basis point in the long run, in response to a spending shock equal to one percent of GDP. Miller and Russek (1991) show that, within a VAR-type approach, larger deficits are associated with increases in long-term interest rates.[31]

D. Current interest rates and long-term deficit projections

A common argument heard in the current macroeconomic context is that the recent deterioration in the long-term budget outlook must not be affecting interest rates since nominal long-term interest rates are relatively low (International Economy 2003). That claim is problematic for four reasons. First, the fact that long-term nominal interest rates are low does not mean they would not have been lower in the absence of the deterioration in the long-term fiscal outlook. Second, for most purposes, the relevant variable for assessing the cost of borrowing is the real interest rate. Because inflation and inflationary expectations are currently quite low compared to historical experience during the 1970s and 1980s, real interest rates are not as low relative to historical levels as nominal rates are. Figure 3 shows that although nominal 10-year bond rates

[31] More specifically, they show that deficits and interest rates are cointegrated, which implies that there must be a relationship between the two and that an error correction term should be added to the vector auto-regression. Miller and Russek (1996) find significant effects of deficits on interest rates using non-VAR methodologies, but a mixed picture from VAR regressions.

are close to their historic lows over the past 40 years, real 10-year bond rates are not.[32]

Third, the overall level of interest rates is affected by many factors, including fiscal policy, monetary policy, and other variables. The past few years, for example, have seen a substantial loosening of monetary policy, declines in the demand for business investment in the United States, a flight to security in U.S. bonds, and sluggish global economic performance. All of these factors will tend to reduce interest rates. Given fluctuations in short-term rates, it may be more insightful to examine the *spread* between long-term and short-term interest rates in assessing the effects of future budget surpluses or deficits**.** Figure 4 shows that the spread in interest rates between the 10-year Treasury bond and the 3-month Treasury bill is currently relatively high compared to its average level since 1960, and that this spread rose substantially since the budget deterioration began in 2001. The spread generally fell as surpluses rose over the 1990s, and rose as surpluses fell in 2001 and early 2002. To be sure, the interest rate spread typically widens during recessions and other periods of sluggish economic performance, and it is unclear to what extent the elevated spread reflects budget dynamics as opposed to other current and expected macroeconomic conditions. The point, however, is that it is not possible to dismiss the potential effect of deficits on interest rates merely by pointing to current nominal interest rates. Fourth, it is possible that the effects of long-term deficits on interest rates are masked or reduced during periods of sluggish economic performance.

VI. Conclusion

Despite strong assertions by some that there is no evidence that deficits affect interest rates, the literature tells a different story. Even without differentiating between studies that do and do

[32] The "real" rate is defined here by adjusting the nominal interest rate for *ex post* inflation, as measured by the CPI-U excluding food and energy.

not take expectations of future deficits into account, a more accurate statement would be that the evidence from the literature as a whole is mixed. But it is essential to take expected future deficits into account in examining the linkages between deficits and interest rates. Studies that incorporate deficit expectations in addition to current deficits tend to find significant connections between deficits and interest rates.

The debate over deficits and interest rates, however, is at least partially a red herring. The more fundamental point is that the preponderance of evidence shows that long-term budget deficits reduce national saving and impose substantial long-run costs on the economy, regardless of whether interest rates are affected. As long as an increase in the budget deficit is not fully offset by an increase in private saving, an expanded deficit will manifest itself in some combination of reduced domestic investment and an expanded current account deficit. Either way, and regardless of the effect of deficits on interest rates, increased budget deficits reduce future income. That reduction in future income is the true cost of sustained budget deficits.

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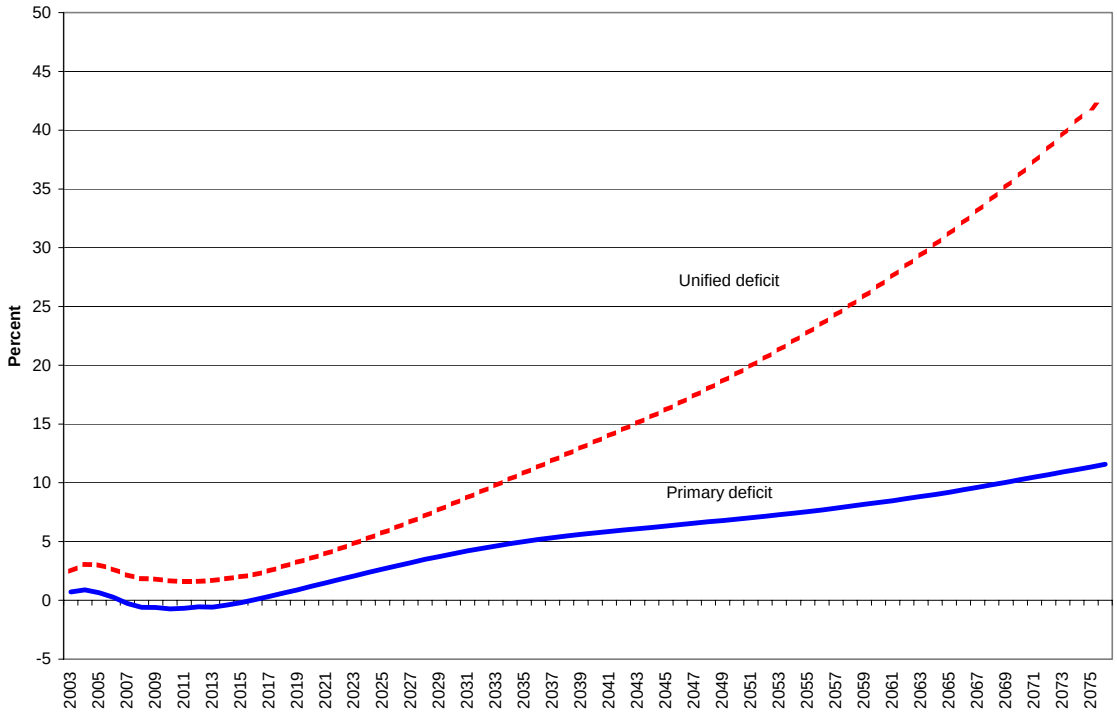
Table 1: Number of papers finding significant effect on interest rates

	Predominately positive significant effect	Mixed effect	Predominately insignificant effect	Total
Measure of deficit				
Expected future or unanticipated current deficit	13	4	1	18
Vector auto-regression dynamics	2	2	6	10
Current deficit/debt	14	5	12	31
Total	29	11	19	59

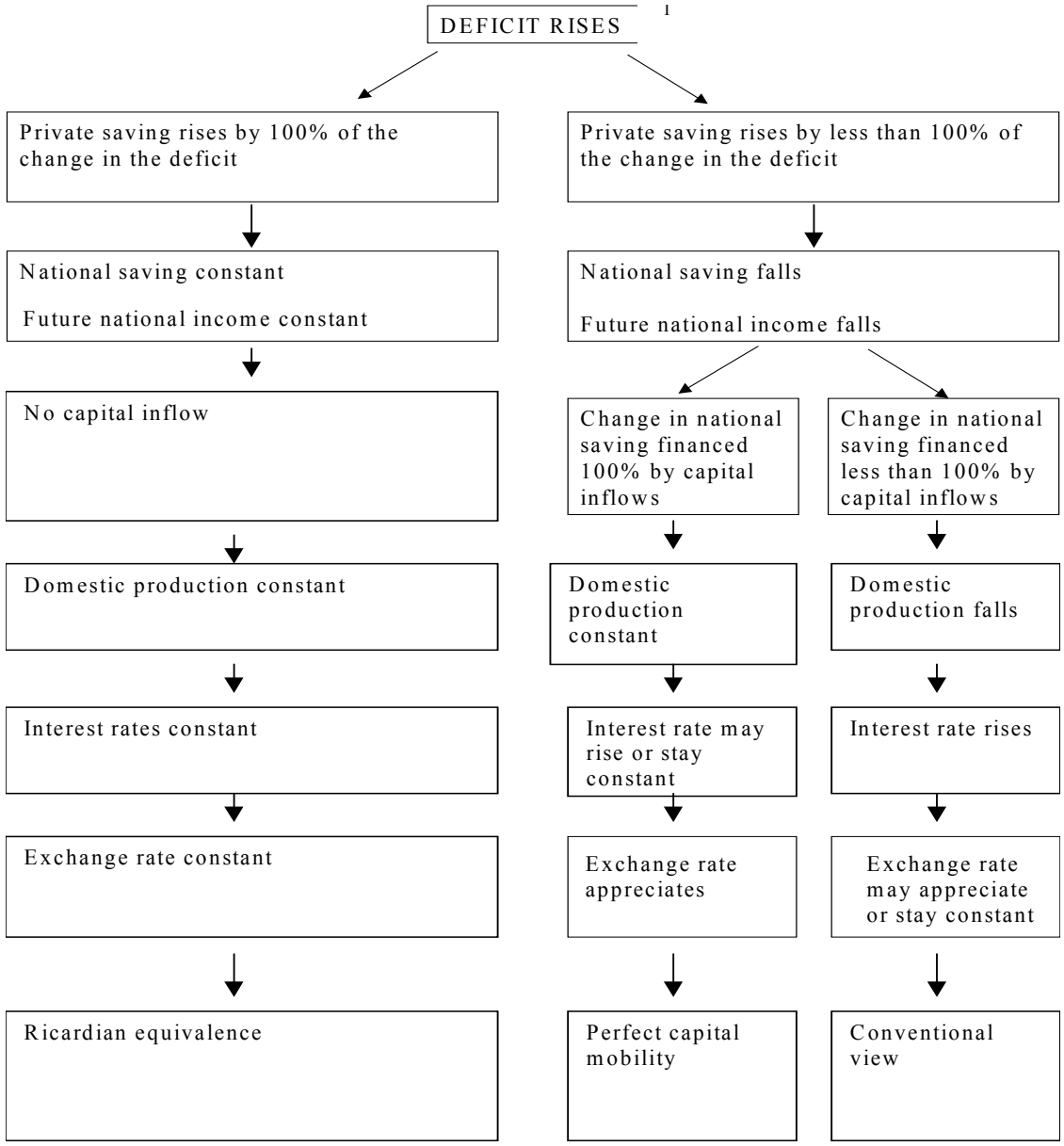
Source: Gale and Orszag (2002), updated to include Laubach (2003).

Figure 1: Projected Primary and Unified Budget Deficits
(percent of GDP)



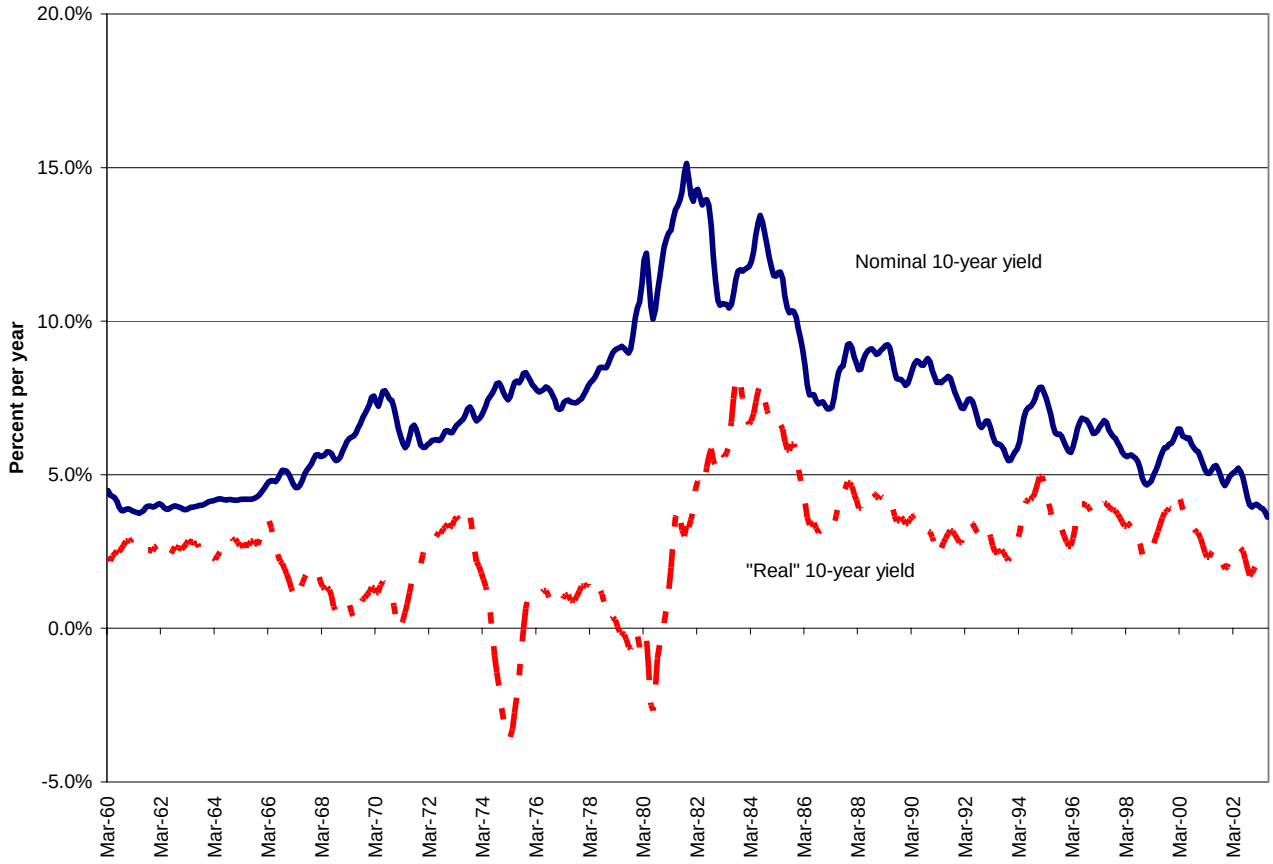
Note: Budget deficits are reported on a NIPA basis.

Figure 2: Effects of Deficits



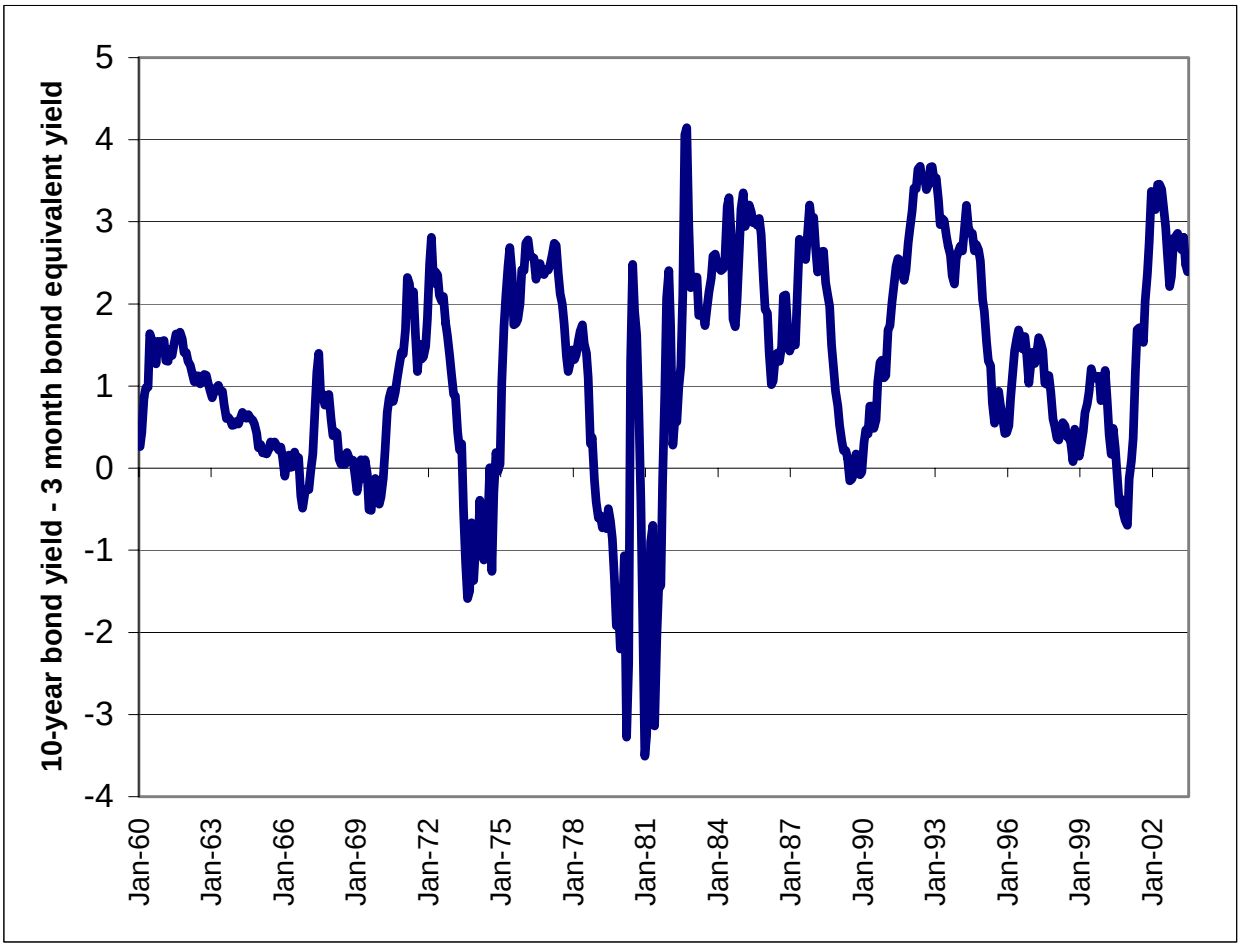
1. For simplicity, we assume the deficit rises because of a lump sum tax cut.

Figure 3: Nominal and real 10-year bond interest rates



Note: The nominal 10-year bond yield is the constant maturity series published by the Federal Reserve. The "real" interest rate is defined as (1+n)/(1+p)-1, where n is the nominal 10-year interest rate and p is the inflation rate based on the CPI-U excluding food and energy for the given month relative to a year earlier. The graph presents a rolling three-month average for both the nominal rate and the real rate.

Figure 4: Spread between 10-year Treasury bond and 3-month Treasury bill since 1960



Note: The 10-year bond yield is the constant maturity series published by the Federal Reserve. The 3-month bond-equivalent yield is based on the secondary market yield series published by the Federal Reserve. The bond-equivalent yield is computed as 365y/(360-91y) where y is the yield on the 3-month bill on a bank discount basis (which is how the secondary market yield is published by the Federal Reserve). The spread is then simply the 10-year bond yield minus the 3-month bond equivalent yield.