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The Economic Effects of Long-Term Fiscal Discipline

William G. Gale and Peter R. Orszag

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William G. Gale is the Arjay and Frances Fearing Miller Chair in Federal Economic Policy at the Brookings Institution. Peter R. Orszag is the Joseph A. Pechman Senior Fellow at Brookings. We thank David Gunter and Manijeh Azmoodeh for excellent research assistance, and Robert Cumby, Douglas Elmendorf, Richard Kogan, and Charles Schultze for valuable comments and discussions. The views expressed are our own and should not be attributed to the trustees, officers or staff of the Brookings Institution.

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Summary

Over the past two years, the long-term budget outlook has deteriorated markedly. Although many policy-makers and economists have expressed concern that this fiscal deterioration will reduce future national income and raise interest rates, Bush Administration officials and others have publicly denied the existence of such adverse effects. This paper examines the relationship between long-term fiscal discipline and economic performance, with two main results. First, as almost all economic research and standard textbooks suggest, declines in budget surpluses (or increases in budget deficits) reduce national saving and therefore reduce future national income, regardless of their effect on interest rates. Second, simple correlations, careful empirical research, macro-econometric models, and the views of leading economists and policymakers all indicate that increases in expected future deficits raise long-term interest rates. Based on the literature, a reasonable estimate is that a reduction in the projected budget surplus (or increase in the projected budget deficit) of one percent of GDP will raise long-term interest rates by between 50 and 100 basis points. These findings suggest that the costs of increased deficits are significant over the long run, and need to be compared carefully to the potential benefits of the tax and spending programs that result in larger long-term deficits.

I. Introduction

Over the past two years, the long-term budget outlook has deteriorated markedly. According to official Congressional Budget Office figures, the projected unified budget balance for 2002 through 2010 deteriorated from a surplus of \$4.7 trillion in January 2001 to essentially zero (\$13 billion) in August 2002.¹ The projected surplus for 2010 alone fell by 3.8 percent of GDP. Policy-makers are currently debating additional policy changes – from new tax reductions to increased spending on homeland security – that would cause further deterioration in the long-term budget outlook.

Some Administration officials assert that the dramatic deterioration in the budget outlook has little or no economic consequence. Their argument often focuses specifically on the effects of long-term budget deficits on interest rates. For example, the Chairman of President Bush's Council of Economic Advisers has recently stated, "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."² Similarly, the *Wall Street Journal* editorial page recently claimed, "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 empirical evidence to support this argument when Mr. Rubin trotted it out, and there still isn't."³

Despite these assertions, a wide variety of perspectives -- including simple correlations, careful empirical research, leading macro-econometric models, and the views of numerous leading academics, policy makers, and government agencies -- all suggest that projected budget deficits affect long-term interest rates and economic performance. As just one example, the Council of Economic Advisers under the first President Bush wrote, "Economic theory and empirical evidence indicate that expectations of deficit reduction in future years, if the deficit reduction

¹ The projected surplus for 2002 through 2011 fell from \$5.6 trillion in January 2001 to \$336 billion in August 2002.

² Richard W. Stevenson, "Bush's Way is Clear to Press His Agenda for the Economy," *New York Times*, November 11, 2002. See also Hubbard (2001a, 2001b, 2002a, 2002b, 2002c, 2002d, 2002f), Andrews (2002), and Pearlstein (2002).

³ "The Deficit Gambit," *Wall Street Journal*, December 11, 2002, page A18. Hassett (2001) similarly argues, "almost every recent study that has been published on this topic has failed to find any link between moderate increases in

commitment is credible, can lower interest rates as financial market participants observe that the government will be lowering its future demand in the credit market.⁴ Remarkably, despite his recent assertions that there is no evidence that deficits affect interest rates, Hubbard (2002e) estimates that interest rates would decline by 35 basis points if the 2001 tax cut were repealed and the funds used to reduce the long-term budget deficit.⁵

The purpose of this paper is to examine the evidence on the economic effects of long-term fiscal discipline, including effects on interest rates. As we explain below, the recent academic literature suggests a more substantial connection between anticipated fiscal deficits and current interest rates than the Administration's statements would suggest. The debate over the precise relationship between deficits and interest rates, however, should not obscure the more fundamental point: Everything else being equal, larger budget surpluses or smaller budget deficits raise the nation's income over the long term.

The reason that fiscal discipline promotes long-term growth is that budget surpluses are a form of national saving.⁶ Higher national saving increases the assets owned by Americans and leads to higher future national income.⁷ Other things equal, the recent deterioration in the long-term budget outlook means that national saving and future national income will be significantly lower than if the surpluses had been preserved.

It is worth noting that this paper is not about the effects of short-term deficits. Currently, the primary macroeconomic problem is inadequate aggregate demand for the goods and services that could be produced by firms. A temporary increase in the budget deficit is therefore helpful in

deficits and rises in interest rates. Kevin A. Hassett, "Economic Stimulus," Testimony before the Senate Budget Committee, October 25, 2001.

⁴ Council of Economic Advisers, *Economic Report of the President*, February 1991, page 64.

⁵ Hubbard (2002e), page 7. This estimate implicitly assumes that the tax cut would sunset in 2010, as it is officially scheduled to do. The interest rate effect from repealing the tax cut is significantly attenuated because of this assumption.

⁶ Fiscal discipline can expand the size of the future economy in two ways. It could raise the growth rate permanently, or it could lead to higher growth in the medium term and a higher level of income (but not a higher rate of growth of that income) in the long term. We abstract from these distinctions here.

⁷ As explained in more detail below, higher national saving today increases national income in the future regardless of whether the increase in national saving is absorbed through an increase in domestic investment or net foreign investment. In the latter case, the increase in future income would reflect an increase in receipts from abroad (relative to the baseline), rather than an increase in domestic output.

spurring demand. Over the longer term, however, the key to improved living standards is an expansion in the capacity of domestic firms to produce goods and services and an increase in the net flow of income from abroad. It is important to remember that the effects of temporary budget deficits in the short term, given conditions of inadequate aggregate demand, may differ substantially from the effects of budget deficits in the long term.

This paper has eight sections including this introduction. The second section provides background on the long-term budget outlook. The third section describes the important relationships among budget surpluses, national saving, national income, and interest rates. The fourth section discusses the effects of future budget deficits on current long-term interest rates. The fifth section presents the evidence, from structural macro-econometric models and the reduced-form econometric literature, on the connection between deficits and interest rates. The sixth section explores the connections between budget deficits and borrowing from abroad. The seventh section briefly examines the impact of long-term deficits on uncertainty. A final section offers conclusions.

II. Background on the long-term budget outlook

Before turning to the effects of budget deficits, it is important to appreciate the scale of the budget difficulties facing the nation. The aging of the baby boomers, lengthening life spans, and rising health care costs generally will place increasing pressure on the Federal budget in years to come. The Congressional Budget Office (2002a) projects that Federal expenditures on Social Security, Medicare, and Medicaid will rise from under 8 percent of GDP currently to 15 percent by 2040 and 21 percent by 2075, the last year of the long-term projections. By way of comparison, *total* Federal spending averaged 20 percent of GDP over the last 40 years and was 18.4 percent of GDP in 2001.

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.⁸ Recent estimates imply that the fiscal gap through 2075 is between 1.4 percent and 4.8 percent of GDP, and that the permanent fiscal gap (including the years beyond 2075) is between 4.1 percent and 7.8 percent of GDP. This implies that an immediate increase in taxes or reduction in spending of *at least* 1.4 percent of GDP would be needed to maintain fiscal balance over the long term (Auerbach, Gale, Orszag and Potter 2002).

The fiscal gap calculations underscore the long-term cost of making permanent the 2001 tax cut. Making the tax cut permanent rather than allowing it to sunset as scheduled in 2010 raises the fiscal gap over the next 75 years by between 1.5 and 1.9 percent of GDP.⁹ To put that figure in context, the actuarial deficit in Social Security over the next 75 years amounts to 0.7 percent of GDP. Despite the Administration's claims that the tax cut involves only a modest budgetary cost, the cost of the tax cut over the next 75 years thus would be more than twice the actuarial deficit in Social Security.¹⁰ On a comparable basis, the 2001 tax cut (assuming it is made permanent) is also only slightly smaller than the net cost of the tax cuts in the early 1980s.¹¹ Such comparisons underscore the point that the fiscal implications of the 2001 tax cut are significant.

To be sure, the precise size of the fiscal gap is subject to significant uncertainty. The exact magnitude of the estimates should therefore be viewed with some caution. The existence of a substantial long-term budget problem, however, should not be. Almost all 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.¹²

⁸ Over an infinite planning horizon, this requirement is equivalent to assuming that the debt-GDP ratio does not explode. See Auerbach (1994, 1997), Auerbach and Gale (1999, 2000, 2001), and Congressional Budget Office (2000).

⁹ See Auerbach, Gale, and Orszag (2002a) and Auerbach, Gale, Orszag, and Potter (2002). 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.

¹⁰ Richard Kogan, Robert Greenstein, and Peter Orszag, "Social Security and the Tax Cut: The 75-Year Cost of the Tax Cut Is More than Twice as Large as the Long-Term Deficit in Social Security," Center on Budget and Policy Priorities, updated April 11, 2002.

¹¹ The comparisons take into account two factors: The effect of inflation on the budget baseline before the tax code was indexed to inflation in 1985, and the 1982 tax increases that partially offset the 1981 reductions. See Peter Orszag, "How the Bush Tax Cut Compares in Size To the Reagan Tax Cuts," Center on Budget and Policy Priorities, February 2001.

¹² See CBO (2001b), Lee and Edwards (2001), and Shoven (2002). Auerbach and Hassett (2001, 2002) address the optimal policy response to uncertainty in long-term forecasts.

III. Budget surpluses, national saving, and national income

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. (For details, see Appendix 1.) In particular, 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 is used to finance either domestic investment or net foreign investment. In other words, national saving either finances the accumulation by Americans of assets at home (domestic investment) or it finances the accumulation by Americans of assets abroad (net foreign investment).¹³ Either way, that accumulation of assets means that the capital stock owned by Americans is increased. The returns to that additional capital -- whether domestic or foreign -- raise the income of Americans in the future. These macroeconomic building blocks highlight two key points:

- *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.* The empirical evidence suggests only limited offsets from private savings in response to budget shifts.¹⁴ CBO (1998c) concluded that private saving may offset 20 to 50 percent of such a shift.¹⁵ Elmendorf and Liebman (2000) argue that private saving would offset 25 percent of an increase in the deficit.¹⁶ Gale and

¹³ Net foreign investment is the nation's investment overseas minus borrowing from abroad (foreign investment in the United States). Thus an increase in net foreign investment may take the form of increased U.S. investment overseas, reduced foreign investment in the United States, or reduced U.S. borrowing from abroad. The impact on future national income is the same, however: Net income from abroad is raised in future years, either because assets owned abroad are increased or borrowing from abroad is reduced.

¹⁴ Barro (1974) demonstrates that if households are fully rational and take the well-being of their descendants into account in formulating their consumption and savings patterns, reductions in taxes today would be balanced by offsetting increases in private saving today. In particular, households would recognize that the reduction in taxes today would increase future tax liabilities and thus save the tax cut. Numerous tests of household saving behavior, however, conclude that households do not follow the dictates of this model (Bernheim 1989).

¹⁵ Congressional Budget Office, "Description of Economic Models," November 1998c. This estimate incorporates the indirect effect of budget shifts on private saving through interest rates. In other words, one of the reasons that private saving could increase in response to an expansion in the budget deficit is that the increase in the budget deficit raises interest rates, which may then induce some additional private saving.

¹⁶ Douglas W. Elmendorf and Jeffrey B. Liebman, "Social Security Reform and National Saving in an Era of Budget Surpluses," *Brookings Papers on Economic Activity*, 2000(2): 1-71. Also note that the Council of Economic Advisers under President Clinton argued that no private saving offset should be expected from a shift in the budget balance. See Council of Economic Advisers, *Economic Report of the President*, February 1994, page 83.

Potter (2002) estimate that private saving will offset 31 percent of the decline in public saving caused by the 2001 tax cut.¹⁷

- *A reduction in national saving must correspond to a reduction in national investment and in future national income, other things equal.* That is, the decline in national saving must reduce private domestic investment, net foreign investment, or some combination thereof.¹⁸ The reduction in investment reduces the capital stock owned by Americans, and therefore reduces the flow of future capital income. Either the domestic capital stock is reduced (if the reduction in national saving crowds out private domestic investment) or the nation is forced to mortgage its future capital income by borrowing from abroad (if the reduction in national saving generates a decline in net foreign investment). In either case, future national income is lower than it otherwise would have been.

No economist would dispute the accounting identity that national saving must equal the sum of domestic investment and net foreign investment, since that identity must hold by definition. The only issue is how the elements of that identity come back into alignment following a decline in national saving. There are only two possibilities:

- First, interest rates may rise. At a given interest rate, a reduction in national saving relative to current domestic and net foreign investment implies a shortage of funds to finance such investments. That imbalance puts upward pressure on interest rates as firms compete for the limited pool of funds to finance their investment projects. The increase in interest rates then serves to reduce domestic and net foreign investment and bring national saving and investment back into equality.
- Second, the entire decline in national saving may be financed by increased capital inflows from abroad. These capital inflows would dampen and perhaps eliminate the increase in domestic interest rates. The potential absence of an effect on interest rates in this case does not imply,

¹⁷ Gale and Potter (2002), page 186.

¹⁸ The empirical evidence suggests that most of the reduction in national saving manifests itself in domestic investment. Over the long-term, changes in net foreign investment flows are estimated to account for between 25 and

however, that the reduction in national saving entails no economic cost: The capital inflows represent a reduction in net foreign investment (an increase in the amount that Americans borrow from overseas) and thus a reduction in future national income. In other words, regardless of the effect on interest rates, the equality between national saving and domestic plus net foreign investment must continue to hold, and a reduction in national saving must therefore reduce the capital owned by Americans.

Focusing solely on the connection between interest rates and deficits thus obscures the more important point: *Unless an increase in the budget deficit is entirely offset by an increase in private saving, it must produce a reduction in either domestic investment or net foreign investment. It must therefore reduce the capital stock owned by Americans and reduce future national income.* Figure 1 illustrates this logic: The important junction is not the one marked by C in that figure, but rather than the one marked by A.

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, smaller budget surpluses reduce future national income relative to what it would otherwise be. It is important to realize, however, that everything else is not equal, and a full analysis of the effects of reducing surpluses or increasing deficits should take into account the effects of the spending programs or tax reductions financed by the reduction in the surplus. 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.¹⁹

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

40 percent of changes in national saving. For specific studies, see, among others, Feldstein and Bacchetta (1991), Feldstein and Horioka (1980), and Obstfeld and Rogoff (2000). For an overview of such studies, see CBO (1997b).

¹⁹ The returns to public capital investments are controversial. See Aschauer (1990), Aaron (1990), and Congressional Budget Office (1998a).

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.

Box 1: Estimating the impact on future income from dissipating projected budget surpluses

A back-of-the-envelope calculation may help to illustrate the effects of dissipating future budget surpluses. The deterioration in the budget outlook between January 2001 and August 2002, according to Congressional Budget Office projections, results in an increase in the Federal government's net public debt at the end of Fiscal Year 2011 equal to 33.3 percent of GDP.²⁰ That increase reflects the cumulative deterioration in government saving between 2001 and 2011 under the official forecasts.

If 25 percent of the deterioration in government saving is offset by increased private saving, the budget shift reduces the stock of net assets owned by Americans at the end of 2011 by 25 percent of GDP ($=0.75*33.3$).²¹ To translate this change in the capital stock into a change in income, it is necessary to assume a rate of return to the capital. One recent estimate suggests a pre-tax marginal product of capital of 8.5 percent for nonfinancial corporate capital.²² Elmendorf and Mankiw (1999) suggest a more conservative estimate, 6 percent, for the return on aggregate capital.²³ Using this more conservative figure for the rate of return on capital, the deterioration in the budget balance over the next 10 years reduces real Gross National Product (which includes income received by Americans on their foreign investments) in 2012 by 1.5 percent.²⁴ The estimated reduction in Gross National Product is the equivalent today of about \$1,500 *per year* for each household in the United States.²⁵

²⁰ In January 2001, CBO projected that the "net indebtedness" of the Federal government (that is, outstanding debt held by the public minus the "balance of uncommitted funds" that was projected to arise when the public debt had been reduced to its minimum possible level) would amount to -13.9 percent of GDP at the end of FY 2011. See CBO, *The Budget and Economic Outlook: An Update, January 2001a*, Tables 1.1 and 1.2. In August 2002, CBO projected that debt held by the public would amount to 19.4 percent of GDP at the end of FY 2011. See CBO, *The Budget and Economic Outlook: An Update, August 2002*, Table 1.2.

²¹ Assuming that one-third of that amount reflects changes in net foreign investment and two-thirds reflects changes in domestic investment, Americans' claims on assets abroad would be reduced by approximately 8.3 percent of GDP at the end of 2011, and the domestic capital stock would be reduced by approximately 16.7 percent of GDP.

²² James M. Poterba, "The rate of return to corporate capital and factor shares: new estimates using revised national income accounts and capital stock data," *Carnegie-Rochester Conference Series on Public Policy* 48 (1998), pages 211-246.

²³ Elmendorf and Mankiw (1999), page 1633. The more conservative marginal product of capital estimate partially reflects the fact that the return on capital in the non-corporate sector (e.g., housing) may be lower than in the corporate sector. In 2001, residential investment amounted to \$445 billion and total gross private domestic investment amounted to \$1,586 billion. Gross residential investment is thus roughly a quarter of total gross private investment. If we assume a zero return for residential investment, we obtain a weighted-average marginal product of about 6 percent ($=0.75*8.5+0.25*0$), which is consistent with the Elmendorf and Mankiw (1999) figure.

²⁴ Given the 6 percent marginal product assumption, the reduction in real Gross Domestic Product (which excludes income on foreign capital) would be approximately 1.0 percent.

²⁵ Gross National Product in Q2 2002 amounted to just over \$10.5 trillion. See National Income and Product Account Tables, Table 1.9, available at www.bea.doc.gov, accessed November 12, 2002. A reduction of 1.5 percent would therefore correspond to roughly \$158 billion. According to the March 2000 Current Population Survey, there are 104.7 million households in the United States. See <http://www.census.gov/population/socdemo/hh-fam/p20->

For example, Gale and Potter (2002) estimate that the 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 (because 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.

In summary, although the tax and spending policies that reduce the surplus or raise the deficit can have positive effects on economic activity, the fundamental point of this paper is to document that there are also important costs to dissipating a budget surplus. In particular, a reduction in the surplus (or an increase in the deficit) reduces national saving and hence future national income, *regardless of its effects on interest rates*. The net impact of new tax or spending policies on growth are a combination of their direct effect on behavior and their indirect effect, via their effect on the budget surplus and national saving. Policy-makers should weigh the costs of reduced surpluses (or increased deficits) against any benefits from the programs or tax cuts financed by reducing the surplus (or increasing the deficit).

IV. Future budget surpluses and long-term interest rates

The description above abstracts from an important aspect of reality: the time dimension of the relationship between interest rates and deficits. In particular, since financial markets are forward-looking, interest rates are affected not only by current or past surpluses or deficits, but

[537/2000/tabH1.txt](#). The reduction thus corresponds to about \$1,500 per household. Note that these back-of-the-envelope calculations assume that the return to capital does not depend on whether the investment is domestic or foreign.

also by expectations of future surpluses or deficits. *Anticipated budget surpluses or deficits in the future can affect long-term interest rates today.* In other words, dissipating future surpluses imposes economic costs not only in the long term, but may also drive up long-term interest rates today and thereby hamper economic activity in the short term.

The most common theory of the determination of long-term interest rates is the so-called expectations hypothesis.²⁶ Under that hypothesis, the long-term interest rate today is determined by a weighted average of expected short-term interest rates in the future. For example, assume that the interest rate on a one-year bond is 2 percent this year and is expected to be 4 percent next year. Under the expectations hypothesis, financial market participants would drive the interest rate on a two-year bond to approximately 3 percent, so that investors would be indifferent between buying a two-year bond today (and earning 3 percent per year over the two years as a whole) or buying a one-year bond today and then reinvesting in another one-year bond in a year (and thus expecting to earn approximately 3 percent per year, on average, over the two years as a whole).²⁷

Changes in *projected* surpluses or deficits thus affect economic activity today by affecting current long-term interest rates. There are two ways to see how declines in future budget surpluses raise shorter-term interest rates in the future, and therefore raise long-term interest rates immediately. First, one effect of dissipating future budget surpluses is that the government will be saving less than it otherwise would. As a consequence, the pool of saving available for investment will be reduced. Firms competing for this smaller pool of investment funds will push up the price of borrowing funds -- that is, raise future interest rates. An alternative, but fundamentally equivalent, way of grasping the relationship recognizes that the amount of debt the government is projected to pay down in the future will be smaller (and the national debt will consequently be larger) as a result of the decline in the future budget surplus. The amount of Treasury bonds held

²⁶ For a discussion of alternative hypotheses regarding the term structure of interest rates, see Richard W. McEnally and James V. Jordan, "The Term Structure of Interest Rates," in Frank J. Fabozzi, eds., *The Handbook of Fixed Income Securities* (Homewood, Illinois: Irwin, 1991).

²⁷ Although empirical tests generally reject the joint hypothesis that interest rates reflect the expectations hypothesis and that expectations are rational (Shiller (1990), Shiller, Campbell, and Schoenholtz (1983), Froot (1989), Mankiw (1986), and Mankiw and Summers (1984)), it is important to note that the failure of the joint hypothesis of rational expectations and the expectations theory to hold *precisely* does not necessarily mean that future short-term interest rates do not affect long-term deficits.

by the public will therefore be higher in the future. To persuade investors to hold more bonds, the government will have to offer a higher interest rate.²⁸

The upshot is that anticipated reductions in future budget surpluses or increases in future budget deficits exert upward pressure on expected future interest rates. Since financial markets determine long-term interest rates today at least in part on the basis of what they expect shorter-term interest rates to be in the future, the expected increase in shorter-term interest rates in the future drives up long-term interest rates now. By raising long-term interest rates now, declines in *future* budget surpluses discourage investment and interest-sensitive consumption today, thereby impeding economic activity now.²⁹

Box 2: The level of long-term interest rates today and the budget outlook

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. That argument 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. (As one indication of the fact that long-term rates could be lower, Chairman Greenspan and others have recently indicated that long-term interest rates could be reduced if the Federal Reserve is no longer able to reduce short-term rates through monetary expansions. The implication is clearly that long-term rates could be even lower than they currently are.)
- Second, for most purposes, the relevant variable for assessing the cost of borrowing (and therefore the effect on investment) is the real interest rate, not the nominal interest rate. The real interest rate is the nominal rate minus expected inflation. 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 2 shows that although nominal 10-year bond rates are close to their historic lows over the past 40 years, real 10-year bond rates are not.³⁰

²⁸ Note also that the required increase in the interest rate to induce investors to hold a given increment of debt may be an increasing function of the level of debt itself (if, for example, the probability of default increases as the level of debt increases).

²⁹ See Blanchard (1984) for an early theoretical treatment. Olivier Blanchard, "Current and Anticipated Deficits, Interest Rates, and Economic Activity," NBER Working Paper 1265, January 1984. For a description of how this perspective affected policy-making during the 1990s, see Douglas W. Elmendorf, Jeffrey B. Liebman, and David W. Wilcox, "Fiscal Policy and Social Security Policy During the 1990s," in Jeffrey A. Frankel and Peter R. Orszag, eds., *American Economic Policy in the 1990s* (Cambridge: MIT Press, 2002).

³⁰ The "real" rate is defined here by adjusting the nominal interest rate for inflation, as measured by the CPI-U excluding food and energy.

- Third, the overall level of interest rates is affected by many factors, including fiscal policy, monetary policy, and other variables. Recently, for example, the Federal Reserve has reduced the short-term Federal funds rate to historic lows to bolster aggregate demand. 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 3 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 in the year since the 2001 tax cut. Figure 4 shows the spread over the past ten years, and also underscores that it is currently relatively high, that it generally fell as surpluses rose over the 1990s, and that it 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 market 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. If this were the case, an absence of fiscal discipline could manifest itself partially in a larger increase in real long-term interest rates than would otherwise be the case during the subsequent recovery, rather than being fully reflected in interest rates during the period of sluggishness itself.

V. The evidence on deficits and long-term interest rates

Before turning to the formal evidence on the relationship between deficits and interest rates, it may be helpful to simply examine recent changes in interest rates and changes in projected budget deficits or surpluses. Following the approach adopted in a recent paper by Canzoneri, Cumby, and Diba (2002), Figures 5 through 8 show a strong positive relationship between deficits projected by the Congressional Budget Office (CBO) and the spread between long-term interest rates and short-term interest rates.

Figure 5 shows that over the past two decades, larger 5-year projected deficits (relative to projected GDP) are associated with higher current interest rates on 5-year Treasury bonds relative to three-month Treasury bills. Figure 6 similarly shows that an *increase* in the projected deficit from one period to the next is associated with an *increase* in long-term interest rates relative to short-term rates.³¹ Figures 7 and 8 show the relevant figures for the 10-year forecasts (which CBO

³¹ These scatter-plots are similar if the *ex post* real 5-year bond yield is used instead of the spread between the 5-year bond and the 3-month bill. The graphs are available upon request to the authors.

began issuing in 1992). Again, the figures show a clear, positive relationship between projected deficits (or changes in the projected deficit) and the spread between long-term interest rates and short-term rates (or changes in that spread). It is important to note, however, that the relationship highlighted in these figures could be affected by the state of the business cycle and other factors, which is why more rigorous examination of the relationship is helpful: A more rigorous approach attempts to control for the other factors that could be affecting the relationship between interest rates and deficits.

Box 3: Views on budget deficits and interest rates

The view that budget deficits affect economic performance and interest rates is shared by a wide array of economists, policy-makers, and organizations. For example:

- In 1984, the Council of Economic Advisers under the Reagan Administration wrote: “Measures to reduce the budget deficit would lower real interest rates and thus allow the investment sector to share more fully in the recovery that is now taking place primarily in the government and consumer sectors.”³²
- In 1990, the Council of Economic Advisers under the first Bush Administration wrote: “Economic theory and empirical evidence indicate that expectations of deficit reduction in future years, if the deficit reduction commitment is credible, can lower interest rates as financial market participants observe that the government will be lowering its future demand in the credit market...In other words, expectations of lower interest rates in the future will lower long-term interest rates today. Lower long-term interest rates will reduce the cost of capital, stimulating investment and economic growth relative to what would be predicted if expectations were ignored.”³³
- In 1994, the Council of Economic Advisers under the Clinton Administration wrote: “Much of the recent reduction in long-term interest rates...should be attributed to the change in budget policy in early 1993. The close linkage of the decline in long-term interest rates to the political and legislative events of the last 15 months gives strong support to the view that high Federal debt in the 1980s was responsible for the high real returns on long-term bonds, and that the change in Federal fiscal policy is responsible in large part for the declines in real interest rates.”³⁴
- Professor Martin Feldstein of Harvard University, a leading conservative economist and former Chairman of the Council of Economic Advisers under President Reagan, has argued, “an anticipated future budget deficit means a smaller amount of funds at that future date to finance investment in plant and equipment. Restricting that investment will require a higher real rate of interest. Similarly, the anticipated budget deficit means that individuals will have to be offered a higher yield in the future to induce them to hold the larger amount of government debt in their

³² Council of Economic Advisers, *Economic Report of the President*, February 1984, page 62.

³³ Council of Economic Advisers, *Economic Report of the President*, February 1991, page 64.

³⁴ Council of Economic Advisers, *Economic Report of the President*, February 1994, page 78.

portfolios. Both of these effects raise the expected future interest rate and therefore...they raise the current long-term rate as well.”³⁵ He concludes that “each percentage point increase in the five-year projected ratio of budget deficits to GNP raises the long-term government bond rate by approximately 1.2 percentage points...”³⁶

- Professor John Taylor of Stanford University, currently serving as the Undersecretary of the Treasury for International Affairs, has written, “Economic research – both theory and econometric models – provides evidence that lower budget deficits will lower real interest rates, increase investment, and thereby increase productivity growth and real incomes.”³⁷
- Professor Gregory Mankiw of Harvard University, in a paper co-authored with Professor Laurence Ball of Johns Hopkins University, has written: “To sum up: government budget deficits reduce national saving, reduce investment, reduce net exports, and create a corresponding flow of assets overseas. These effects occur because deficits also raise interest rates and the value of the currency in the market for foreign exchange.”³⁸
- The Congressional Budget Office has repeatedly noted the connection between deficits and interest rates. For example, in evaluating long-term budget options, CBO noted, “As deficits rise, they crowd out capital investment, slow economic growth, and raise interest rates.”³⁹
- The General Accounting Office has noted that “Since the federal government competes with private investors for scarce capital, federal borrowing can reduce the amount available for other investors and put upward pressure on interest rates.”⁴⁰
- The Committee for Economic Development, a nonpartisan business organization, has emphasized: “If the decline in the 2002 budget surplus is seen as a prelude to future budget deficits, long-term interest rates will rise, undermining the effects of fiscal stimulus.”⁴¹
- The International Monetary Fund has emphasized, “government dissaving hurts national saving and lowers future living standards because either domestic investment is reduced or borrowing from abroad is increased, and, with it, future obligations to service foreign debt out of future national income.”⁴²
- Alan Greenspan, Chairman of the Federal Reserve, argued earlier this year that “some of the firmness of long-term interest rates probably is the consequence of the fall of projected budget

³⁵ Martin Feldstein, “Budget Deficits, Tax Rules, and Real Interest Rates,” NBER Working Paper No. 1970, July 1986, page 13.

³⁶ Martin Feldstein, “Budget Deficits, Tax Rules, and Real Interest Rates,” NBER Working Paper No. 1970, July 1986, page 48.

³⁷ John Taylor, “Monetary Policy Implications of Greater Fiscal Discipline,” in *Budget Deficits and Debt: Issues and Options* (Kansas City: Federal Reserve Bank of Kansas City, 1995), page 151.

³⁸ Laurence Ball and N. Gregory Mankiw, “What Do Budget Deficits Do?” in *Budget Deficits and Debt: Issues and Options* (Kansas City: Federal Reserve Bank of Kansas City, 1995), page 99.

³⁹ Congressional Budget Office, “Long-Term Budgetary Pressures and Policy Options,” March 1997a.

⁴⁰ General Accounting Office, “Budget Issues: An Overview of Federal Debt,” GAO/T-AIMD-98-221, June 24, 1998, page 5.

⁴¹ Committee for Economic Development, “Economic Policy in a New Environment: Five Principles,” 2001, page 6.

⁴² International Monetary Fund, *World Economic Outlook*, May 1996, Chapter III, page 50.

surpluses and the implied less-rapid paydowns of Treasury debt.”⁴³ In previous Congressional testimony, Greenspan indicated there was “no question” that the 2001 tax cut affected long-term interest rates.⁴⁴

Box 4: Interest rates and deficits in simplified economic models

Economists have used simplified economic models to examine the relationship between deficits and interest rates.

- The Council of Economic Advisers (1994) under the Clinton Administration analyzed the effects of deficit reduction on interest rates using a growth model developed by Nobel-prize winning economist Robert Solow. The analysis found that a reduction in the deficit after 5 years of about 1.75 percent of GDP would ultimately reduce long-term rates by about 200 basis points.⁴⁵ The deterioration since January 2001 in the budget outlook for 2007 (roughly on the same time horizon, 5 years into the future, as the CEA analysis) amounts to much more than 1.75 percent of GDP. The implication is that the fiscal deterioration, if continued into the future, would raise real interest rates in the long term by well more than 200 basis points.
- Ball and Mankiw (1995) analyze the effects of deficit reduction using a Cobb-Douglas production function (which assumes that labor earns a fixed share of output, and capital earns a fixed share of output). They find that over the longer run, a reduction in government debt equal to 50 percent of GDP would reduce real interest rates by 170 basis points.⁴⁶ Box 1 indicates that the projected net government debt at the end of 2011 has increased by 33 percent of GDP since January 2001. Applying the Ball and Mankiw results, the implication is that the deterioration in the budget outlook would raise real interest rates in the long term by 112 basis points ($=33/50*170$).⁴⁷

These simplified models for examining the relationship between deficits and interest rates are insightful for some purposes, but they share important shortcomings. For example, it is unclear what “the interest rate” in these models represents: a short-term interest rate or a long-term interest rate. The models also do not directly incorporate the effects on interest rates from *anticipated future* changes in the capital stock. In other words, they implicitly ignore the existence of forward-looking behavior by market participants, and thus underestimate the impact of permanent tax changes on interest rates.

⁴³ Alan Greenspan, “The Economy,” Remarks at the Bay Area Council Conference, San Francisco, January 11, 2002.

⁴⁴ Testimony of Alan Greenspan before Committee on Banking, Housing, and Urban Affairs, U.S. Senate, July 24, 2001.

⁴⁵ CEA (1994), pages 82-86.

⁴⁶ Ball and Mankiw (1995), page 105.

⁴⁷ Elmendorf and Mankiw (1999) adopt a similar framework to Ball and Mankiw (1995), but do not explicitly calculate the effects of deficit reduction on interest rates.

The more formal evidence on the connection between budget deficits and interest rates takes two forms. The first comes from the major structural macro-econometric models. The second is the literature examining the reduced-form empirical relationship between deficits and interest rates. We examine each in turn.

Structural macro-econometric models

To our knowledge, almost all major macroeconomic models imply an economically significant connection between changes in budget deficits and 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. (It is worth noting that almost all macroeconomic theories, including those that assume private saving would fully offset any temporary decline in taxes, would suggest that interest rates should increase to some degree in response to an increase in government spending.⁴⁸ For the purposes of examining the effects of reductions in taxes, the results below that specifically examine tax cuts may therefore be more illuminating than the ones that examine increases in government spending.) Table 1 presents the results from the major macro-econometric models.⁴⁹ Appendix 2 describes the results in more detail.

As Table 1 shows, the most widely known and used macro-econometric models estimate economically significant effects on interest rates from budget deficits. An unweighted average of the models listed in Table 1 would suggest that 10-year interest rates would rise by about 50 basis points after one year and about 100 basis points after 10 years in response to an increase in the primary (non-interest) deficit of one percent of GDP.

⁴⁸ An exception is Mankiw (1987), which presents a model in which increases in government purchases reduce real interest rates.

⁴⁹ It is worth noting that many of the results presented in Table 1 apply to reductions in budget deficits. The results from examining reductions in budget surpluses of similar magnitudes would be approximately the same, albeit with the opposite sign.

Table 1: Increase in interest rates from increase in primary deficit of 1 percent of GDP⁵⁰

Model	Tax reduction or spending increase	Effect on 10-year bond yield after one year (basis points)	Effect on 10-year bond yield after ten years (basis points)	Year analysis was published	Notes
CBO	Spending	27	92	1995	Interest rates assumed to be constant after 5 years
DRI	Spending	110	210	1988	Assumes interest rates constant after 5 years; foreign short rates constant; all long rates affected to same degree
Fair	Tax (transfer payments)	1-10	22	2002 (model posted on web)	Assumes interest rates constant after 5 years; range depends on form of monetary policy assumption
Federal Reserve (FRB/US)	Tax	50	70	1999	Taylor rule for monetary policy; 10-year yields computed using expectations hypothesis
Federal Reserve (FRB/US)	Spending	41	20	1999	Taylor rule; 10-year yields computed using expectations hypothesis
Federal Reserve (FRB/US)	Tax	25	50	2002	Taylor rule; tax cut sunsets after 10 years and is followed by tax increases
IMF	Tax	30	5	1998	Assumes tax cut in place for five years, followed by higher taxes to stabilize debt-GDP ratio; assumes Taylor rule for monetary policy
Macro Advisers	Tax	100	143	1998	Applies expectations hypothesis
McKibbin-Sachs	Tax and spending	13	108	1993	Models 1993 deficit reduction package
OECD	Spending	90	200	1988	Assumes interest rates constant after 5 years; foreign short rates constant; all long rates affected to same degree
Taylor	Spending	30	50	1993	Assumes interest rates constant after 5 years
WEFA	Spending	100	220	1988	Assumes interest rates constant after 5 years; foreign short rates constant; all long rates affected to same degree

⁵⁰ The primary deficit excludes interest payments on the public debt.

An unweighted average of the results in Table 1 solely for deficit shifts caused by tax changes (even including those that assume that near-term tax cuts sunset and are then offset by tax increases in the long term) would suggest that 10-year interest rates would rise by about 40 basis points after one year and about 60 basis points after 10 years in response to a reduction in revenue of one percent of GDP. To put that in perspective, note that removing the 2010 sunset on the tax cut passed last year would reduce revenue by between 1.5 and 1.9 percent of GDP (depending on the treatment of interactions between the tax cut and the alternative minimum tax) over the next 75 years.⁵¹ The implication is that removing the sunset would raise interest rates in the long term by between 90 and 115 basis points. (An increase of 100 basis points on a 30-year, \$200,000 mortgage would increase the mortgage payment by roughly \$1,500 per year.)

Reduced-form econometric literature

Another source of evidence on the connections between interest rates and deficits comes from reduced-form econometric studies. These studies attempt to tease out the statistical relationship between interest rates and deficits in the historical data. The literature adopts a wide variety of approaches to measuring interest rates, deficits, and other variables.

One of the key issues involves whether the deficit variables include *expected* future deficits in addition to current or past deficits. The challenge in incorporating market expectations about future deficits is that such expectations are not directly observable. Some studies have therefore used published forecasts from CBO or other sources to proxy for expected deficits.⁵² Others have undertaken “event analysis” of news about the likelihood of deficit reduction legislation. Such event analysis examines the change in interest rates on the day that news about deficit reduction efforts is released. Since news about deficit reduction efforts should cause market participants to change their expectations about future deficits, one would expect interest rates to increase on days

⁵¹ See Auerbach, Gale, and Orszag (2002a,b) and Kogan, Greenstein, and Orszag (2002).

⁵² Kitchen (2002) argues that the movements in expected full-employment deficits are closely correlated with movements in current full-employment deficits, so that the full-employment deficit itself provides a good proxy for the projected full-employment deficit. He finds a statistically significant relationship between interest rate spreads and the current full-employment budget balance as a share of GDP. See John Kitchen, “A Note on Interest Rates and Structural Federal Budget Deficits,” unpublished manuscript, October 2002.

with news suggesting that deficit reduction is less likely and to decrease on days with news suggesting that deficit reduction is more likely.

The inclusion of some measure of expected deficits in the analysis is crucial. Without differentiating between studies that do and do not take such expectations into account, it may appear that the results from the literature as a whole are mixed. Barth et. al (1991) summarizes the literature through 1989. Of the 42 studies it examined, 17 found a “predominately significant, positive” effect of deficits on interest rates (that is, larger deficits increased interest rates); 6 found mixed effects; and 19 found “predominately insignificant or negative” effects.⁵³ Reflecting the variation in results, Elmendorf and Mankiw (1999) conclude that “Our view is that this literature...is not very informative.”⁵⁴ Bernheim (1989) writes that “it is easy to cite a large number of studies that support any conceivable position.”⁵⁵ Barth et. al (1991) similarly conclude, “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. The cost of being wrong – believing that there are no costs to deficits when there are – involves a serious risk for future generations.”⁵⁶ In any case, even by the most generous standard, it is inaccurate to assert that there is “no evidence” that deficits affect interest rates; a more accurate statement would be that the evidence from the literature as a whole is mixed.

Closer examination of the literature, however, suggests the findings may not be as ambiguous as they initially appear. Indeed, studies that (properly) incorporate deficit expectations in addition to current deficits tend to find economically and statistically significant connections between anticipated deficits and current long-term interest rates.⁵⁷ Since financial markets are

⁵³ James R. Barth, George Iden, Frank S. Russek, and Mark Wohar, “The Effects of Federal Budget Deficits on Interest Rates and the Composition of Domestic Output,” in Rudolph G. Penner, ed., *The Great Fiscal Experiment* (Washington: Urban Institute Press, 1991).

⁵⁴ Douglas Elmendorf and Gregory Mankiw, “Chapter 25: Government Debt,” in *Handbook of Macroeconomics* (1999), page 1658.

⁵⁵ B. Douglas Bernheim, “A Neoclassical Perspective on Budget Deficits,” *Journal of Economic Perspectives*, Spring 1989, page 70.

⁵⁶ Barth et. al (1991), page 94.

⁵⁷ 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 in order 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

forward-looking, excluding deficit expectations could bias the analysis toward finding no relationship between interest rates and deficits.⁵⁸ 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.”⁵⁹

Separating the studies in Barth et. al. (1991) according to whether they incorporate *expectations* about deficits, rather than just current or past deficits or debt, is illuminating. Appendix 3 lists the papers in Barth et. al. (1991) classified by their treatment of expectations.

Of the 19 papers listed in Barth et. al (1991) as finding no significant positive effect between deficits and interest rates, 18 either did not take expectations into account or did so only indirectly through a vector auto-regression.⁶⁰ (A vector auto-regression often produces poor forecasts because it assumes that expectations are based on a mechanical projection of past variables and because it typically incorporates only a very limited number of variables.⁶¹ For example, a VAR-based projection of the future deficit under current circumstances would ignore

rates could bias the results. Including both long-term and short-term interest rates in an analysis, even if imperfect, is more likely to be insightful than an analysis that excludes either one. Bernheim (1987), pages 54-55. Studies that include both interest rates tend to find significant effects from deficits.

⁵⁸ Indeed, as Bernheim (1987) emphasizes, if households perfectly anticipated future deficits, one may well find no empirical relationship between the deficit today and interest rates today, even though the path of interest rates and economic activity would be substantially different in the absence of the deficits. Bernheim (1987), page 36.

⁵⁹ Martin Feldstein, “Budget Deficits, Tax Rules, and Real Interest Rates,” NBER Working Paper No. 1970, July 1986, page 14.

⁶⁰ Barth et. al. (1991) note that the results in the Bovenberg (1988) study can become marginally statistically insignificant when different time periods are used, when the regressions are run as first-differences rather than in levels, or when the lagged long-term interest rate is added as a regressor. The coefficient on the expected deficit in all these cases, however, remains positive, and the t-statistics for all but the regression that includes the lagged long-term interest rate are 1.60 or higher. See Barth et. al. (1991), Table 2.8, page 122.

⁶¹ As one example of the flaws in using vector auto-regressions rather than using publicly available projections of deficits for this purpose, note that Evans (1987a) assumed that expected deficits must have been increasing in the 12 months prior to a tax cut and declining in the 12 months prior to a tax increase. He then concluded that since interest rates were not increasing during the period 12 months prior to a tax cut, and not declining during the period 12 months prior to a tax increase, expected deficits must not affect interest rates. (Technically, he examined the residuals from vector auto-regressions involving interest rates, government spending, government deficits, and the money supply, and concluded that the residuals were not positive in the 12 months before a tax cut or negative in the 12 months before a tax increase.) In addition to the fact that the expected deficit may not rise during the 12 months prior to the passage of a tax cut, Evans’ regressions provide very noisy forecasts of interest rates, which may suggest that he excluded important other variables that help to explain them. See Elmendorf (1993) for a more detailed critique of the Evans

the scheduled reductions in tax rates and the elimination of the estate tax that are included in last year's tax legislation. A VAR projection is thus fundamentally backward-looking, and fails to incorporate information that may be widely available to market participants about future events. Vector auto-regressions are discussed further in the summary of recent papers in Appendix 4.)

More research on the topic has been undertaken since the Barth et. al. (1991) review. These papers also underscore the crucial role played by expectations about future deficits or surpluses in determining whether a study tends to find an effect on interest rates (see Appendix 4 and Appendix 5). Table 2 combines the papers reviewed in Barth et. al. (1991) with the papers written since then.

As Table 2 shows, *all but one* of the papers using CBO (or commercial) projections of the deficit or "event analysis" of news about deficit reduction efforts find a significant relationship between deficits and interest rates. Given the measurement error and other econometric problems typically involved in efforts to study the connection between deficits and interest rates (Elmendorf and Mankiw 1999), this result is striking. 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 (as discussed in Appendix 3).

Table 2: Number of papers finding significant effect on interest rates

	Predominately positive significant effect	Mixed effect	Predominately insignificant effect	<i>Total</i>
<i>Measure of deficit</i>				
Expected future or unanticipated current deficit	12	4	1	<i>17</i>
Vector auto-regression dynamics	2	2	6	<i>10</i>
Current deficit/debt	14	5	12	<i>31</i>
<i>Total</i>	28	11	19	<i>58</i>

Source: Barth et al (1991) and authors' calculations. Also see Appendix 3 through Appendix 5.

paper, and Appendix 3 below for further discussion of the problems associated with using vector auto-regressions to study expected deficits, as Evans does.

The magnitude of the effect on interest rates from the studies that incorporate projected deficits is generally consistent with the results from the structural macro-econometric models. For example, Elmendorf (1993) 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) find that an increase in the projected CBO deficit averaging one percent of current GDP is associated with an increase in the long-term interest rate relative to the short-term interest rate of 53 to 60 basis points; and Cohen and Garnier (1991) find that an increase in the projected OMB deficit of one percent of GNP raises the 10-year interest rate by 53 to 56 basis points. Note that these effects represent the short-term impact on long-term interest rates, not the ultimate impact on long-term interest rates. The range – an increase of roughly 40 to 60 basis points in long-term interest rates from an expansion in the projected deficit of one percent of national income – should thus be compared to the results from the structural macro-econometric models for the effect on long-term interest rates after one year. Both approaches suggest effects in the same broad range.

Our conclusion from this evidence is that despite recent statements to the contrary, the empirical literature on interest rates and deficits provides support for the notion that changes in expected future deficits affect current long-term interest rates. Of the 17 papers we have identified as incorporating published forecasts of deficits or examining news regarding deficit reduction packages, 12 find statistically significant linkages between deficits and interest rates and 4 find mixed effects. Only one paper fails to find any effect from projected deficits on interest rates.

The simple graphs presented in Figures 5 through 8 underscore this point: The spread between long-term interest rates and short-term interest rates is clearly related to CBO forecasts of budget surpluses or deficits, whatever the underlying causal relationship. The macro-econometric models used by the Federal Reserve, the Congressional Budget Office, and others also provide support for the notion that deficits affect interest rates.

VI. Deficits, net foreign investment, and the current account

The effect of deficits on interest rates would presumably be even more substantial if the United States did not have access to international capital markets. As emphasized above, part of

the reduction in national saving associated with increased deficits manifests itself in lower domestic investment, and part manifests itself in lower net foreign investment (i.e., more borrowing from abroad). If domestic investment had to decline sufficiently to offset the entire reduction in national saving, rather than having part of the decline in national saving result in reduced net foreign investment, the upward pressure on interest rates would be greater.

Some proponents of the view that deficits do not affect interest rates take this argument to an extreme, arguing that international capital flows basically eliminate any incipient increase in domestic interest rates. For example, Hassett (2001) argues, “when open international capital markets allow countries to draw on each other’s savings, small increases in the amount of one country’s debt will be offset by savings pulled into that country from abroad, leaving interest rates little changed.”⁶² As demonstrated above, this extreme view of no significant effect of deficits on interest rates is inconsistent with the empirical literature that incorporates expectations into the analysis, it is inconsistent with the findings of the major macro-econometric models, and it is inconsistent with a series of studies showing that changes in domestic saving and domestic investment are highly correlated, which suggests that capital is not perfectly mobile across national boundaries (see, for example, Feldstein and Horioka 1980).

Perhaps more importantly, it is crucial to remember that *even if capital mobility eliminated the effect of budget deficits on interest rates, those deficits would still reduce future national income by reducing net foreign investment and thereby increasing the nation’s indebtedness to foreigners*. In other words, assume that the extreme view of Hassett (2001) were correct. In that case, increased budget deficits would reduce national saving but not affect interest rates or domestic investment. Instead, the reduction in national saving associated with an increased budget deficit would manifest itself as a reduction in net foreign investment rather than domestic investment.⁶³ The impact on future income, however, would be similar: Instead of reducing the

⁶² Kevin A. Hassett, “Economic Stimulus,” Testimony before the Senate Budget Committee, October 25, 2001.

⁶³ In this scenario, one would also expect to see a significant connection between budget deficits and exchange rates, since the flow of international capital that eliminates any impact on interest rates would affect exchange rates. Yet the same authors that Hassett cites as proof that deficits do not affect interest rates also find that deficits do not affect exchange rates. See, for example, Paul Evans, “Is the Dollar High Because of Large Budget Deficits?” *Journal of Monetary Economics* 18 (1986), pages 227-249. For an analysis that finds a significant effect of deficits on exchange rates once expectations of future deficits are included, see Martin S. Feldstein, “The Budget Deficit and the Dollar,” in Stanley Fischer, ed., *NBER Macroeconomics Annual 1986* (Cambridge: MIT Press, 1986b).

domestic capital stock, budget deficits would represent a mortgage of the income from that capital, with the mortgage owned by foreigners. As Elmendorf and Mankiw (1999) emphasize, “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.”⁶⁴

The mirror image of a reduction in net foreign investment is an expansion in the current account deficit. (The current account is equal to net exports of goods and services plus net factor payments from abroad plus net unilateral transfers.) In particular, net foreign investment must be equal to the current account balance. To see why, note that if we import more than we export (a current account deficit), we must be selling assets or borrowing the difference from abroad (negative net foreign investment). Conversely, if we export more than we import, we must be lending to foreigners or accumulating assets abroad (positive net foreign investment).⁶⁵ In other words, a current account deficit must correspond to negative net foreign investment. The implication is that the reduction in national saving associated with an expanded budget deficit will at least partially manifest itself in a larger current account deficit and a more negative net foreign investment position. (One mechanism that produces the larger current account deficit is an appreciation in the real exchange rate, just as one mechanism that produces a decline in domestic investment is an increase in real interest rates.) The increased current account deficit entails additional borrowing from abroad that must be repaid in the future, highlighting the economic costs of budget deficits.

Increased budget 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

⁶⁴ Elmendorf and Mankiw (1999), page 1637. Elmendorf and Mankiw note several caveats to this statement, including differential tax implications of investment abroad relative to investment at home and income distributional implications.

⁶⁵ As an alternative way of seeing why the two must be equal, note that the value of dollars sold on foreign exchange markets must be equal to the value of dollars bought on foreign exchange markets. If sales of dollars to finance imports exceed the purchases of dollars to finance exports, the implication must be that the sales of dollars to finance investments or lending abroad are less than the purchases of dollars to finance foreign investments in or lending to the United States.

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.’⁶⁶ 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 current account deficits may extend beyond narrow economic ones. As Professor Benjamin Friedman of Harvard University has argued, “World power and influence have historically accrued to creditor 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.”⁶⁷

VII. Uncertainty

A final issue worth emphasizing is that long-term deficits create significant uncertainty, since an unsustainable fiscal policy must ultimately be addressed in some way. After all, the government cannot continue to run deficits so large that the public debt grows faster than output. Since something that is not sustainable must ultimately come to an end in some fashion, an unsustainable fiscal stance raises a series of questions that increase uncertainty: What specific taxes will be raised? What specific spending programs will be reduced? Will the government be forced to resort to extreme measures, such as printing money to finance deficits? The existence of a significant fiscal gap, with estimates of the imbalance over the next 75 years ranging from 1.4 to 4.8 percent of GDP, makes long-term planning much more difficult than it would be in the absence of such a fiscal gap.

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

⁶⁶ Edwin M. Truman, “The International Implications Of Paying Down The Debt,” Institute for International Economics, Policy Brief Number 01-7, May 2001.

⁶⁷ Benjamin Friedman, *Day of Reckoning: The Consequences of American Economic Policy Under Reagan and After* (New York: Random House, 1988).

is that uncertainty is not eliminated, and may well be increased, by enacting legislation that is clearly unsustainable.

VIII. Conclusion

Despite strong assertions by some that there is no evidence that deficits affect interest rates, the facts tell a different story. Even without differentiating between studies that do and do 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 (properly) incorporate deficit expectations in addition to current deficits tend to find significant connections between deficits and interest rates. Of the 17 papers we have identified as taking expectations into account, 12 find statistically significant linkages between deficits and interest rates and another 4 find mixed effects. Only one paper fails to find any effect from projected deficits on interest rates. The macro-econometric models used by the Federal Reserve, the Congressional Budget Office, and others also provide support for the notion that deficits affect interest rates.

Estimates from the macro-econometric models suggest that an increase in the budget deficit of 1 percent of GDP would raise long-term interest rates by about 50 basis points after one year and about 100 basis points after 10 years. Estimates from the empirical literature that examines the relationship between interest rates and projected deficits are more difficult to standardize, but are broadly consistent with an effect of about 50 basis points after one year in response to a fiscal shift of one percent of GDP. The widespread finding that anticipated deficits affect current interest rates is also reflected in statements from the Council of Economic Advisers in the Reagan Administration, the first Bush Administration, and the Clinton Administration, as well as other leading policy makers. Given the evidence on the connection between interest rates and projected deficits, the burden of proof should be on those who claim there are no such effects.

The debate over deficits and interest rates, however, is at least partially a red herring. The more fundamental point is 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 -- and

such a full offset is a theoretical possibility that almost all economists reject in practice -- the expanded budget 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 a failure of long-term fiscal discipline.

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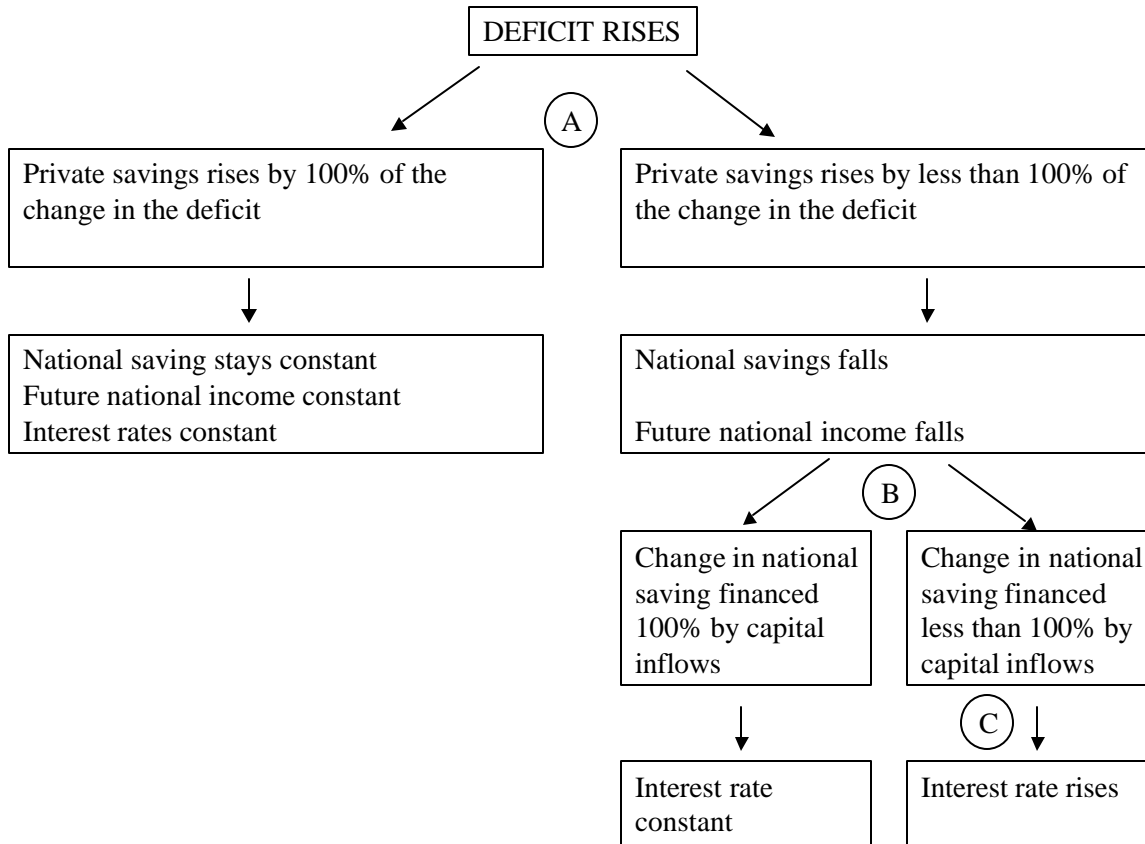
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Figure 1: Logic of the national income accounting identities

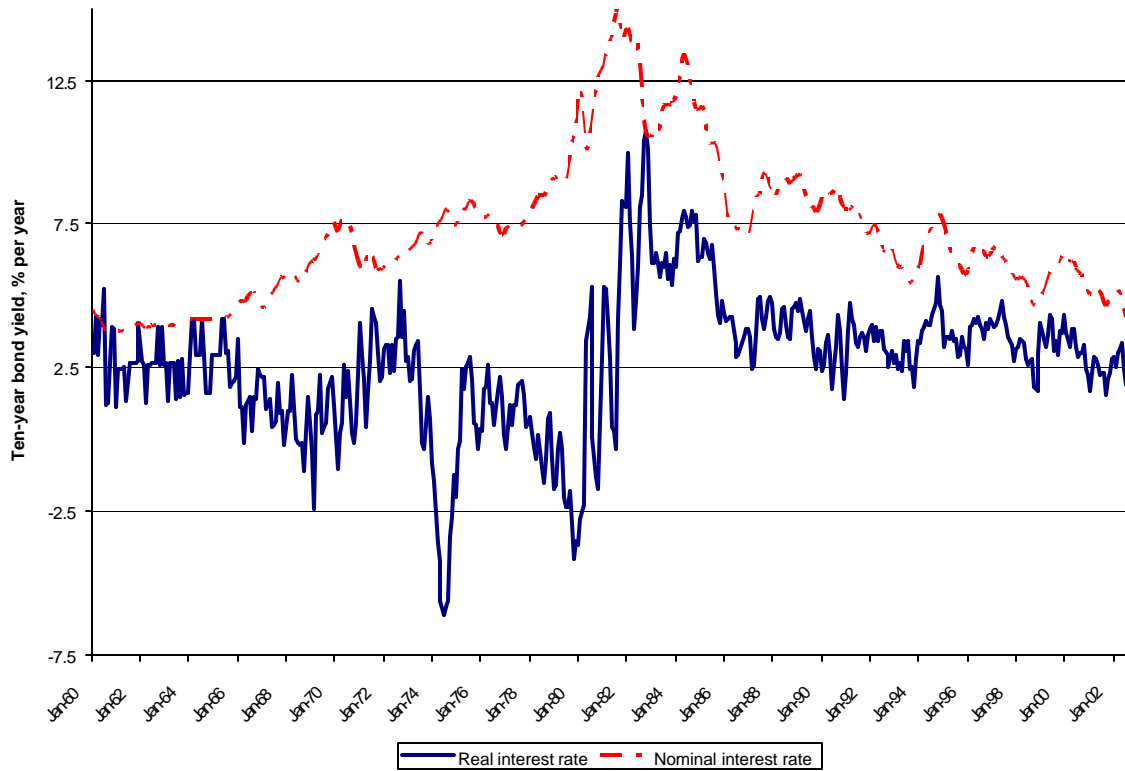


A: The empirical evidence suggests that private saving rises by far less than 100 percent of the reduction in public saving. Estimates suggest that between 20 percent and 50 percent of a reduction in public saving is offset by increases in private saving (see pages 6-7).

B: The empirical evidence suggests that most of the reduction in national saving manifests itself in reductions in domestic investment. Changes in net foreign investment flows are estimated to account for between 25 percent and 40 percent of changes in national saving (see footnote 18).

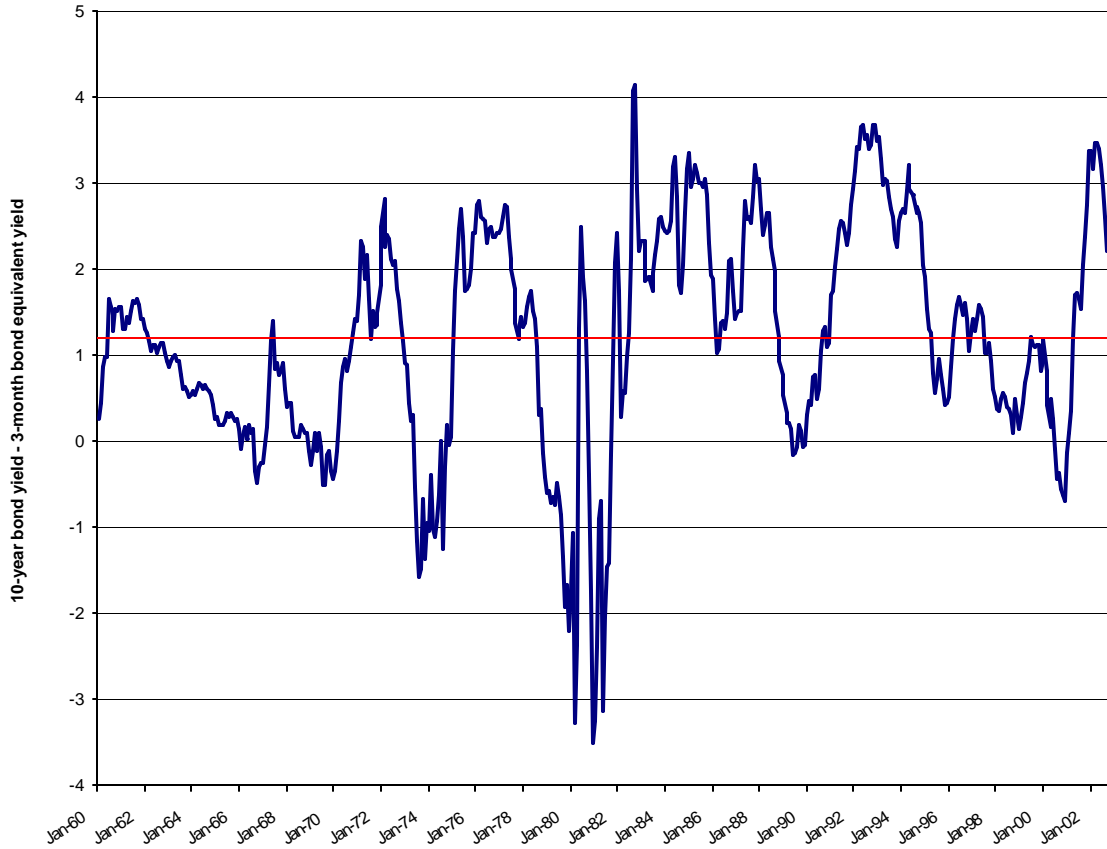
C: Macro-econometric models and empirical evidence suggests that a sustained 1 percent of GDP decline in the primary budget surplus raises long-term interest rates by about 50 basis points in the near term and about 100 basis points after 10 years.

Figure 2: Nominal and real 10-year bond interest rates



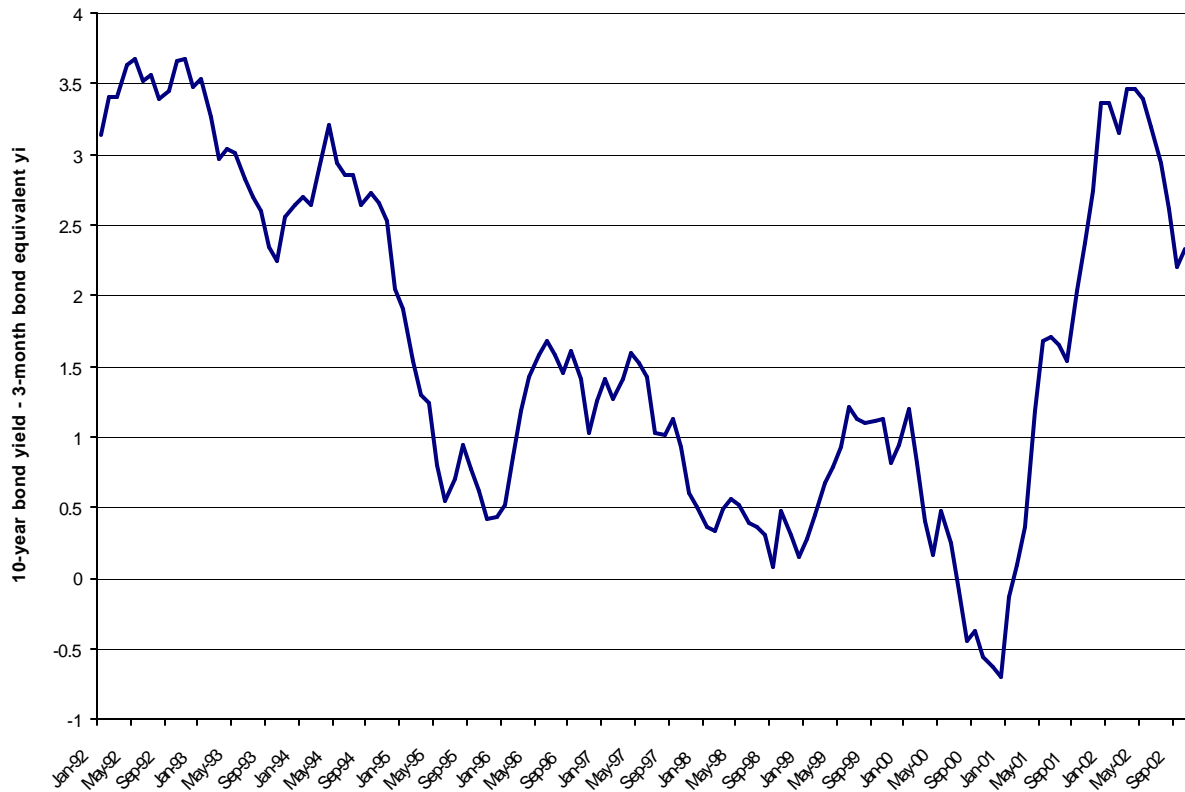
Note: The nominal 10-year bond yield is the constant maturity series published by the Federal Reserve. The “real” interest rate is defined as $(1+n)/(1+p)-1$, where n is the nominal 10-year interest rate and p is the annualized inflation rate based on the CPI-U excluding food and energy in the given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

Figure 3: 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.

Figure 4: Spread between 10-year Treasury bond and 3-month Treasury bill since 1992



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.

Figure 5: 5-Year Projected Deficits and Interest Rates, 1982-2002

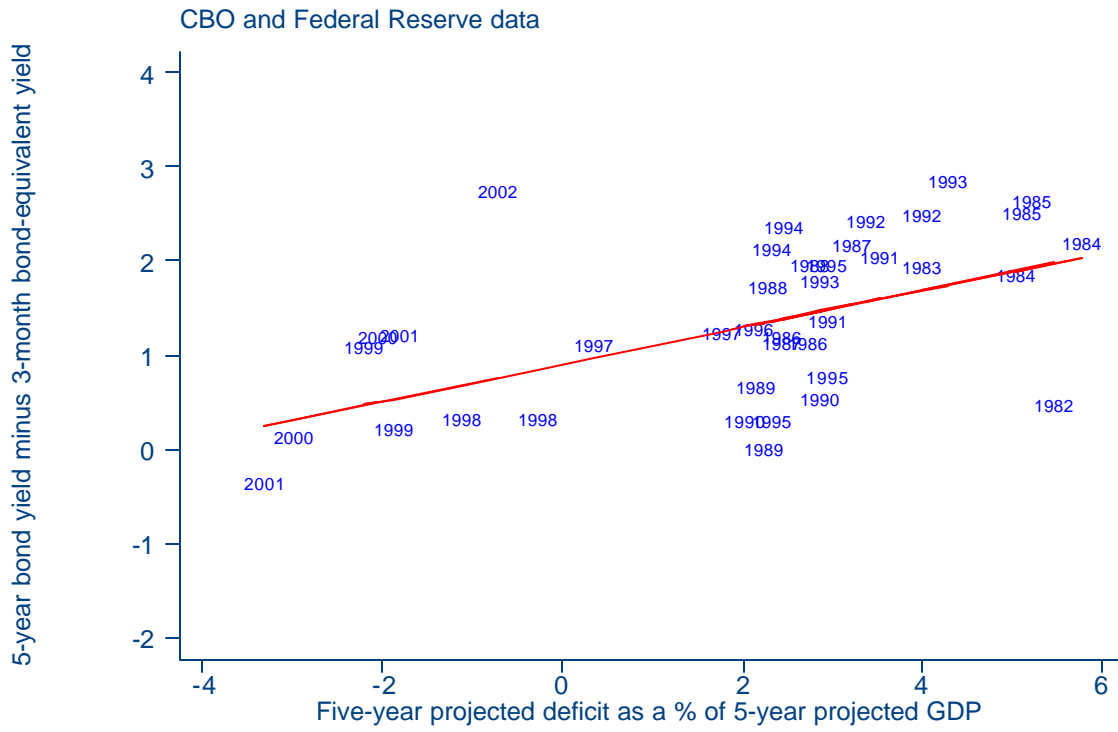


Figure 6: Change in 5-Year Projected Deficits and Change in Interest Rates, 1983-2002

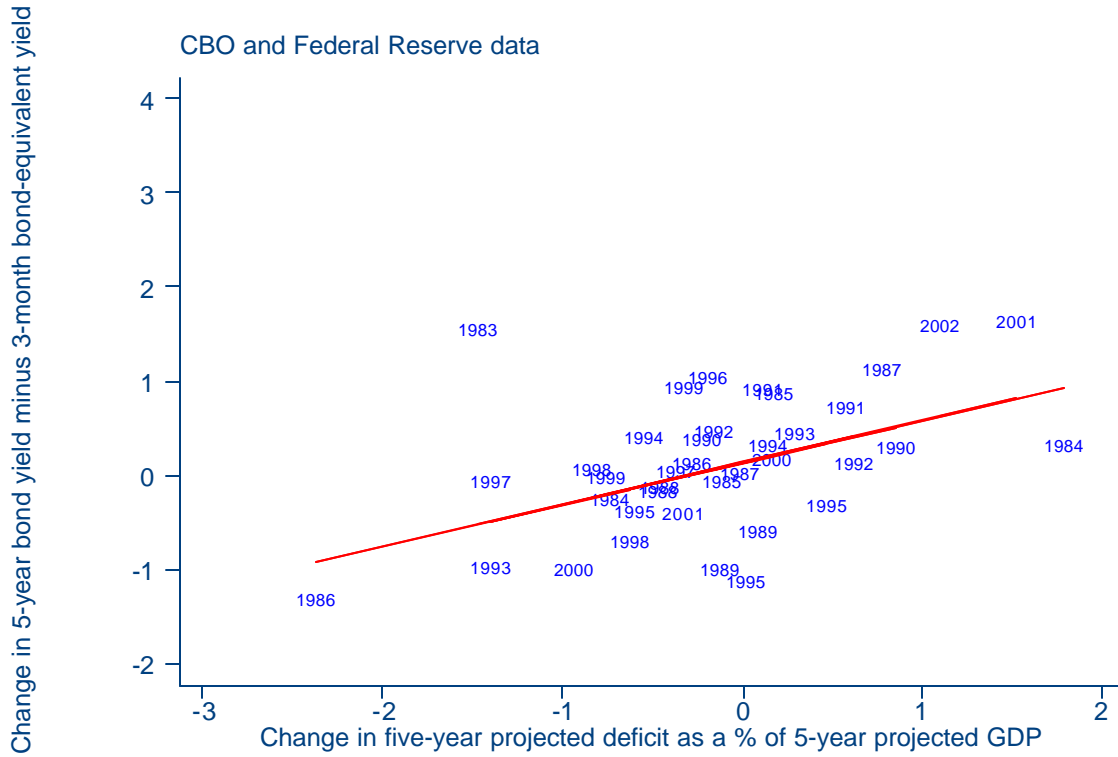


Figure 7: 10-Year Projected Deficits and Interest Rates, 1992-2002

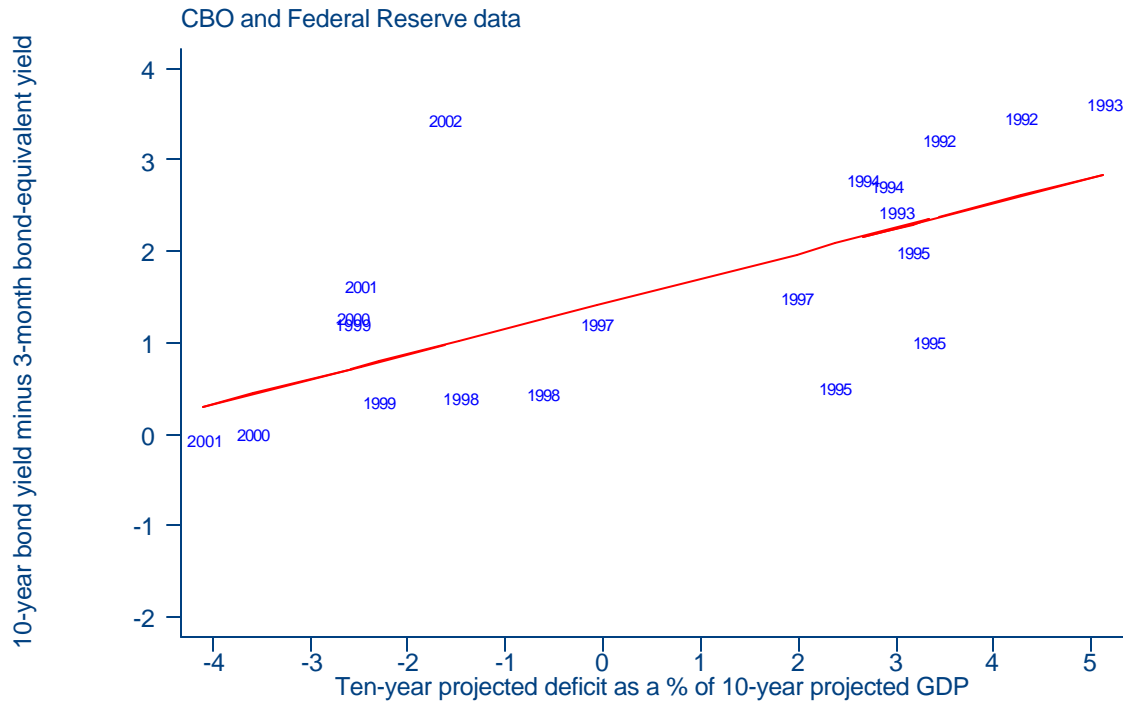
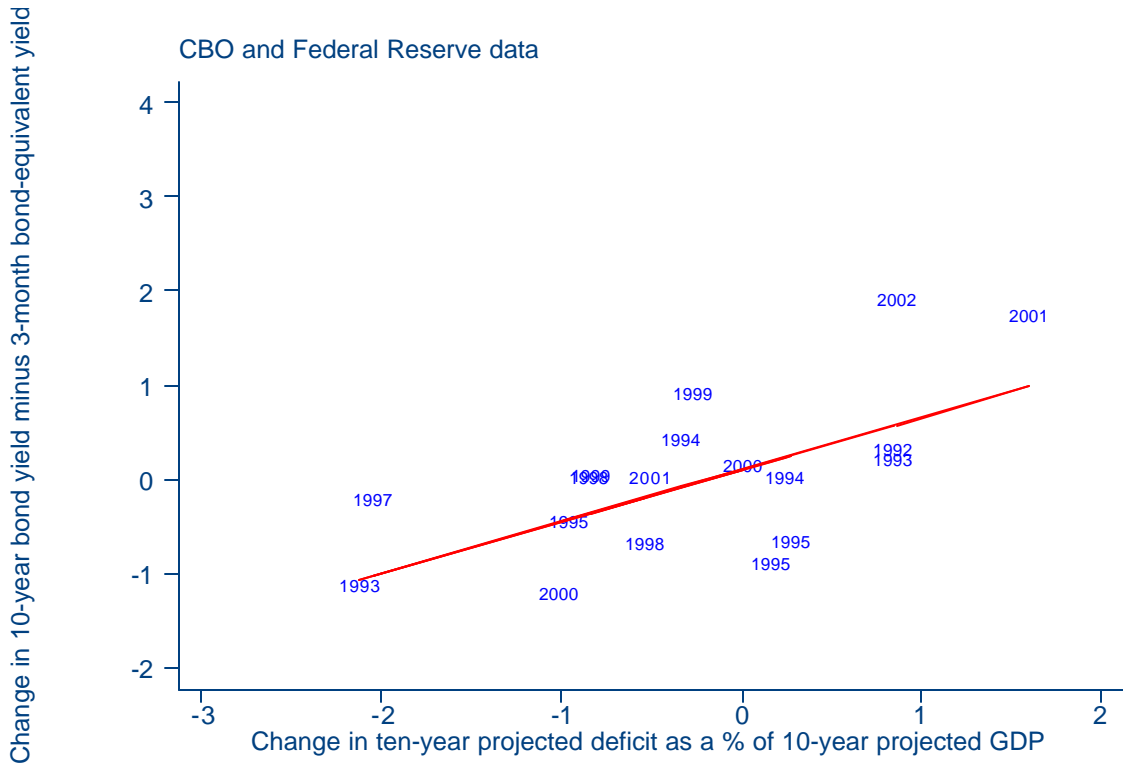


Figure 8: Change in 10-Year Projected Deficits and Change in Interest Rates, 1992-2002



Appendix 1: The national income accounting identities

The national income accounting identities state that:

$$Y=C+I+G+NX \quad \{1\}$$

where Y is Gross Domestic Product or Gross National Product, C is consumption, I is gross private domestic investment, G is government spending on goods and non-capital services plus government investment and depreciation on government capital, and NX is net exports. (The definition of NX will determine whether Y is GDP or GNP. If NX includes net factor payments from abroad, Y is equal to GNP. If NX excludes such payments, Y is equal to GDP.) Since the private sector can either spend or save its after-tax flow of income, we obtain:

$$C+P_s=Y-(T-TR) \quad \{2\}$$

where P_s is gross private saving, T is taxes, and TR is government transfers.

Substituting {2} into {1}, and noting that $G= G_c+G_I+G_D$, where G_c is government spending on goods and non-capital services, G_I is gross government investment, and G_D is depreciation on government capital, we obtain:

$$P_s+[T-(G_c+G_D+TR)]=(I+G_I)+NX \quad \{3\}$$

The second term on the left-hand side of {3}, $[T-(G_c+G_D+TR)]$, is one measure of the budget surplus and thus measures public saving. It differs from the unified surplus recorded in the Federal budget because it includes state and local governments, because of slightly different definitions assigned to T and TR, and because G_D is included as a government outlay in the national income accounts, whereas G_I is included as a government outlay in the unified budget. (This final effect is relatively minor, since G_D in 2000 was only \$1.1 billion below G_I .) For more detail on these sources of discrepancy, see Tables 3.18B and 5.1 of the National Income and Product Accounts, available at <http://www.bea.doc.gov>.

The left-hand side of {3} is national saving, the sum of private saving and government saving. The right-hand side of {3} is equal to private plus public investment plus net exports. Since net exports are equal to investment abroad minus borrowing from abroad (net foreign investment), and since private investment plus public investment is equal to domestic investment, we obtain:

$$\text{National saving} = \text{Domestic investment} + \text{net foreign investment} \quad \{4\}$$

Appendix 2: Results from structural macro-econometric models

This Appendix describes the results listed in Table 1 in the text.

Congressional Budget Office

The Congressional Budget Office uses a macro-econometric model in making its budget projections and in analyzing various budget issues. In 1995, the Congressional Budget Office evaluated the impact of a fiscal shift that reduced primary deficits by 1.9 percent of GDP between 1996 and 2002.⁶⁸ CBO concluded that the budget shift would reduce 10-year interest rates by 50 basis points after 1 year and 170 basis points after 5 years.⁶⁹ A budget shift of one percent of GDP would therefore reduce 10-year interest rates by approximately 27 basis points after 1 year and 92 basis points after 5 years.

DRI model

According to CBO (1995), the DRI model suggests that reducing the primary deficit by 1.9 percent of GDP between 1996 and 2002 would have reduced interest rates by nearly 400 basis points.⁷⁰ CBO does not provide details on the timing of that reduction.

The DRI International Model was included in a major review of macro-econometric models conducted by the Brookings Institution in the late 1980s (Bryant et al 1988).⁷¹ The results show that a reduction of U.S. government spending on goods and services equal to 1 percent of

⁶⁸ The total deficit reduction in the scenario examined by CBO amounted to \$1.3 trillion between 1996 and 2002 (Table B-1), of which \$0.2 trillion was in the form of reduced interest payments. The primary deficit shift was therefore \$1.1 trillion. CBO provides nominal GDP figures through 2000 (Table 4). We projected the GDP figures for 2001 and 2002 by using the lagged growth rate implicit in the published CBO figures; the result is that nominal GDP amounts to \$61 trillion for the period 1996-2002. CBO assumed that the deficit reduction occurred through outlay reductions, but noted that the “broad conclusions apply...to many other ways of reaching balance.”

⁶⁹ Congressional Budget Office, “Analysis of the President’s Budgetary Proposals for Fiscal Year 1996,” April 1995, Table B-2, page 53.

⁷⁰ Congressional Budget Office, “Analysis of the President’s Budgetary Proposals for Fiscal Year 1996,” April 1995, page 56. The scenario examined a total deficit reduction package of 2.2 percent of GDP between 1996 and 2002; the primary deficit reduction amounted to 1.9 percent of GDP.

⁷¹ Ralph C. Bryant, Dale W. Henderson, Gerald Holtham, Peter Hooper, and Steven A. Symansky, eds., *Empirical Macroeconomics for Interdependent Economies* (Washington: Brookings Institution, 1988).

GNP (assuming no change in foreign short-term interest rates) would reduce long-term interest rates in the United States by 110 basis points after one year and 210 basis points after 5 years.⁷²

Fair

Professor Ray Fair of Yale has developed the Fair macro-econometric model, which is posted on a website for public use (<http://fairmodel.econ.yale.edu/>). We simulated the web-based version of the U.S. model to examine the effects of increasing the budget deficit by one percent of GDP for five years (the maximum forecast horizon of the model). The expanded deficit was assumed to arise from an increase in transfer payments. The results, available upon request to the authors, show that real long-term government bond rates would rise by between 1 and 10 basis points after 1 year and 22 basis points after 5 years.

Federal Reserve Board: FRB/US

Reifschneider et al (1999) describe and apply the FRB/US model, a large-scale, quarterly econometric model developed and used at the Federal Reserve Board. That model finds that given a Taylor rule for monetary policy (under which the Federal Reserve adjusts its target short-term interest rate in response to inflation and the output gap), a permanent tax increase of 1 percent of GDP would reduce the real federal funds rate by 20 basis points after 1 year and 70 basis points after 10 years.⁷³ Using the estimated changes over time in the Federal funds rate and the expectations theory of the term structure, the implied yields on 10-year bond rates rise by 50 basis points in the first year and by 70 basis points after 10 years. Reifschneider et al (1999) also examine a permanent increase in government purchases of goods and services equal to 1 percent of GDP. That change raises the real Federal funds rate by 70 basis points after one year and 20 basis points after 10 years; the implication is that it would raise the 10-year rate by 41 basis points after one year and 20 basis points after ten years. Elmendorf and Reifschneider (2002) use the FRB/US

⁷² Bryant et. al. (1988), *Supplemental Volume*, DRI Results for Simulation C, Page 136. Page 33 of the volume suggests that the interest rate generated in for these simulations is the real interest rate, not the nominal interest rate (Bryant et. al., page 33). Some of the baseline projections from the models suggest that the interest rate in some cases may have been the nominal rate, however.

⁷³ David Reifschneider, Robert Tetlow, and John Williams, "Aggregate Disturbances, Monetary Policy, and the Macroeconomy: The FRB/US Perspective," *Federal Reserve Bulletin*, January 1999, Table 4.

model to study a tax cut equal to 1 percent of GDP that sunsets after 10 years. Their primary results suggest that the 10-year bond rate would increase by roughly 25 basis points after one year and slightly under 50 basis points after 10 years.⁷⁴

IMF

The International Monetary Fund has created an international macro-econometric model called MULTIMOD (for MULTI-region econometric MODel). The most recent version of the model, completed in the late 1990s, is MULTIMOD Mark III. That model suggests that a temporary tax cut equal to two percent of GDP for five years that is followed by tax increases that stabilize the ratio of debt-GDP at a level 10 percentage points higher than under the baseline would raise real 10-year interest rates by 60 basis points after one year and 40 basis points after 5 years.⁷⁵ In the long run, the real interest rate would be 10 basis points higher than under the baseline despite no long-run change in the budget deficit. The implication is that a temporary tax cut equal to one percent of GDP would raise real 10-year interest rates by approximately 30 basis points after one year and 5 basis points in the very long run.

Macroeconomic Advisers

Macroeconomic Advisers, LLC, a private economics consulting firm, developed the Washington University Macro Model of the United States economy (WUMM). In October 1998, Macroeconomic Advisers used the WUMM to examine a proposal to cut taxes by \$791 billion between 2000 and 2009. Based on CBO's August 1998 projections, that tax cut would have amounted to 0.7 percent of GDP.⁷⁶ The Macroeconomic Advisers' analysis suggests such a tax cut would have raised 90-day Treasury yields by approximately 50 basis points after one year and

⁷⁴ Douglas W. Elmendorf and David L. Reifschneider, "Short-Run Effects of Fiscal Policy with Forward-Looking Financial Markets," prepared for the National Tax Association's 2002 Spring Symposium 2002, Figures 1 and 2.

⁷⁵ Douglas Laxton, Peter Isard, Hamid Faruqee, Eswar Prasad, and Bart Turtelboom, "MULTIMOD Mark III: The Core Dynamic and Steady-State Models," IMF Occasional Paper 164, International Monetary Fund, May 1998, Chapter II, pages 12-13.

⁷⁶ The CBO projections provide nominal GDP figures through 2008. See Congressional Budget Office, *The Economic and Budget Outlook: An Update (Table 1-2 corrected 9/8/98)*, August 1998b, Table 1-2. We estimated the figure for 2009 by extrapolating the growth rate from 2008. The resultant nominal GDP for 2000-2009 is \$112.7 trillion.

approximately 100 basis points after seven years.⁷⁷ Applying the expectations hypothesis and assuming that short-term rates remain constant after seven years, the implication is that 10-year rates would rise by approximately 70 basis points after one year and by 100 basis points after 10 years. For a tax cut of 1 percent of GDP, 10-year rates would therefore rise by 100 basis points after one year and by 143 basis points after 10 years.

McKibbin-Sachs

McKibbin and Bagnoli (1993) use the McKibbin-Sachs-Global model (MSG2) to estimate that a decline in primary deficits of 1.5 percent of GDP would reduce 10-year bond rates by 20 basis points after one year and 160 basis points after 10 years.⁷⁸ A decline in deficits of 1 percent of GDP would therefore reduce 10-year interest rates by 13 basis points after one year and 108 basis points after ten years.

Organization for Economic Cooperation and Development

The Organization for Economic Cooperation and Development (OECD) maintains the Interlink macro-econometric model. That model was included in the Brookings project on macro-econometric models in the late 1980s. According to the OECD model, reducing government spending on goods and services by 1 percent of GNP (assuming no change in foreign short-term interest rates) would reduce long-term interest rates in the United States by 90 basis points after one year and 200 basis points after 5 years.⁷⁹

Taylor

Professor John Taylor of Stanford University has constructed a macro-econometric model. Taylor uses this model to analyze a permanent decline in government spending that grows to 3 percent of GDP over 5 years and averages 2.4 percent of GDP over 10 years. That change reduces

⁷⁷ Macroeconomic Advisers LLC, "Does It Matter What We Do With The Surplus?" October 29, 1998.

⁷⁸ Warwick McKibbin and Philip Bagnoli, "Fiscal Deficit Reduction: An Evaluation of Alternatives," Brookings Discussion Papers in International Economics #101, The Brookings Institution, July 1993, Table 1 and Figure 10e. We calculated the primary deficit shift by subtracting the interest payment change from the total deficit change.

⁷⁹ Bryant et. al. (1988), *Supplemental Volume*, DRI Results for Simulation C, Page 136.

real long-term rates by about 100 basis points after 1 year and about 150 basis points after 5 years.⁸⁰

WEFA Model

Wharton Econometrics Forecasting Associates has now merged with DRI to form DRI-WEFA. Previously, however, WEFA maintained its own macro-econometric model. According to that model, reducing government spending on goods and services by 1 percent of GNP (assuming no change in foreign short-term interest rates) would reduce long-term interest rates in the United States by 100 basis points after one year and 220 basis points after 5 years.⁸¹

⁸⁰ John Taylor, *Macroeconomic Policy in a World Economy*, (New York: W.W. Norton & Company), 1993a, Table 7.4. Taylor produces similar results in John B. Taylor, "The Use of the New Macroeconometrics for Policy Formulation," *American Economic Review* (May 1993b): Vol. 83, No. 2, pages 300-305. The results for the Taylor model in the Brookings project, assuming no change in the foreign money supply, are also consistent (once one adjusts for the size of the reduction in government spending). See Bryant et. al. (1988), *Supplemental Volume*, Taylor Results for Simulation B, Page 288.

⁸¹ Bryant et. al. (1988), *Supplemental Volume*, WEFA Results for Simulation C, Page 326.

Appendix 3: Papers in Barth et al. (1991)

Predominately positive significant effect	Mixed effect	Predominately insignificant effect
<i>Expected or unanticipated deficit</i>		
<ol style="list-style-type: none"> 1. Barth and Bradley (1985) 2. Bovenberg (1988) 3. Feldstein (1986a) 4. Makin and Tanzi (1984) 5. Thomas and Abderrezak (1988a) 6. Thomas and Abderrezak (1988b) 7. Wachtel and Young (1987) 	<ol style="list-style-type: none"> 1. Kim and Lombra (1989) 2. Sinai and Rathjens (1983) 	<ol style="list-style-type: none"> 1. Bradley (1986)
<i>VAR-based dynamics</i>		
		<ol style="list-style-type: none"> 1. Evans (1985) 2. Evans (1987a) 3. Evans (1987b) 4. Evans (1989) 5. Plosser (1982) 6. Plosser (1987)
<i>Current deficit or debt</i>		
<ol style="list-style-type: none"> 1. Barth, Iden, and Russek (1985) 2. Carlson (1983) 3. Cebula (1987) 4. Cebula (1988) 5. de Leew and Hollaway (1985) 6. Feldstein and Eckstein (1970) 7. Hoelscher (1986) 8. Hutchison and Pyle (1984) 9. Kudlow (1981) 10. Muller and Price (1984) 	<ol style="list-style-type: none"> 1. Dewald (1983) 2. Echols and Elliott (1976) 3. Tanzi (1985) 4. Zahid (1988) 	<ol style="list-style-type: none"> 1. Canto and Rapp (1982) 2. Feldstein and Chamberlain (1973) 3. Frankel (1983) 4. Giannaros and Kolluri (1985) 5. Hoelscher (1983) 6. Kolluri and Giannaros (1987) 7. Makin (1983) 8. Mascaro and Meltzer (1983) 9. Motley (1983) 10. Swamy et al (1988) 11. Tatom (1984) 12. U.S. Treasury (1984)

Appendix 4: Results from recent empirical studies

This Appendix describes the papers that have been published since the Barth et. al. (1991) review that incorporate some measure of expected deficits.⁸² It also discusses the shortcomings associated with using vector auto-regressions as a proxy for projected deficits or surpluses.

Recent studies using published forecasts to proxy for expected deficits

One approach to incorporating expected deficits is to use published forecasts of the deficit as a proxy for market expectations. Elmendorf (1993), for example, uses forecasts of the deficit from Data Resources, Inc. (DRI).⁸³ Elmendorf finds that an increase in the projected deficit of one percent of GNP raises five-year bond yields by 43 basis points (Elmendorf 1993, Table 2).

Canzoneri, Cumby, and Diba (2002) use CBO projected surpluses and find a statistically significant relationship between those projections and the interest rate spread. Their analysis suggests that an increase of projected future deficits averaging one percent of current GDP are associated with an increase in the long-term interest rate relative to the short-term interest rate of 53 to 60 basis points.⁸⁴

Cohen and Garnier (1991) examine OMB projected surpluses. They 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.⁸⁵ 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

⁸² We do not discuss the papers listed in Appendix 5 that rely solely on current or past deficits and debt variables.

⁸³ Douglas W. Elmendorf, "Actual Budget Deficits and Interest Rates," Mimeo, Department of Economics, Harvard University, March 1993.

⁸⁴ Matthew B. Canzoneri, Robert E. Cumby, and Behzad T. Diba, "Should the European Central Bank and the Federal Reserve Be Concerned About Fiscal Policy?" presented at the Federal Reserve Bank of Kansas City's symposium on "Rethinking Stabilization Policy," Jackson Hole, Wyoming, August 2002, page 35.

⁸⁵ Darrel Cohen and Olivier Garnier, "The Impact of Forecasts of Budget Deficits on Interest Rates in the United States and other G-7 Countries," Division of Research and Statistics, Federal Reserve Board, 1991, Tables 6 and 7.

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.⁸⁶

Recent studies using “event analysis” of news reports or announcements of budget projections

Another approach involves “event analysis” of news reports about deficit reduction legislation or budget projections. As described above, this approach examines the change in interest rates on the day in which deficit news is released, since the news would presumably change expectations about future deficits. Several recent studies have adopted this approach.

Elmendorf (1996) carefully examines financial market reactions to events surrounding passage of the Gramm-Rudman-Hollings legislation in 1985 and the Budget Enforcement Act of 1990.⁸⁷ 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.⁸⁸

Several other recent papers examine interest rate changes surrounding the release of new budget projections. Thorbecke (1993) uses both OMB and CBO projections.⁸⁹ He 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.⁹⁰ Quigley and Porter-Hudak (1994) use both CBO and OMB forecasts to examine the impact of announcements about the budget. They find that a one-percent increase in the deficit itself (not as a percentage of GDP)

⁸⁶ Cohen and Garnier, Table 8.

⁸⁷ CEA (1994) similarly studies the events surrounding passage of the Omnibus Budget Reconciliation Act of 1993 (OBRA 1993). CEA argues 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.” Council of Economic Advisers, *Economic Report of the President*, February 1994, page 78.

⁸⁸ Douglas W. Elmendorf, “The Effects of Deficit Reduction Laws on Real Interest Rates,” Finance and Economics Discussion Series, Federal Reserve Board, October 1996.

⁸⁹ Willem Thorbecke, “Why Deficit News Affects Interest Rates,” *Journal of Policy Modeling*, 1993 15(1), 1-11.

⁹⁰ Thorbecke concludes that, “Econometricians, plagued by simultaneity and temporal aggregation problems, have been unable to determine conclusively whether deficits affect interest rates. Financial market participants, who bet millions of dollars on their theories, accept as a practical reality that deficits compete with private investment and net

raises short-term interest rates by 0.37 to 0.87 basis points.⁹¹ Assuming a baseline deficit of 2 percent of GDP, the implication is that an increase in the deficit equal to 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 on long-term interest rates. He finds that an expansion in the deficit projection of one percent of GDP raises 10-year bond yields by 3.4 basis points for one-year budget projections.⁹² He also finds statistically significant but even smaller effects for multi-year budget projections on long-term interest rates.

Recent studies using vector auto-regressions

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 published before the Barth et. al. (1991) review, including Evans (1987a) and Plosser (1982, 1987), also used this approach.

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.

claims on the rest of the world for U.S. saving, thereby raising real interest rates and the dollar.” Thorbecke (1993), page 10.

⁹¹ Michael Regan Quigley and Susan Porter-Hudak, “A New Approach in Analyzing the Effect of Deficit Announcements on Interest Rates,” *Journal of Money, Credit, and Banking*, November 1994, Vol. 26, No. 4.

⁹² John Kitchen, “Domestic and international financial market responses to Federal deficit announcements,” *Journal of International Money and Finance*, Vol. 15, No. 2, 1996, pages 239-254.

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.⁹³ As noted above, a VAR-based projection of the future deficit would basically ignore the scheduled reductions in tax rates and the elimination of the estate tax that are included in last year's 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 OMB or DRI.⁹⁴ Despite these limitations, several recent papers have applied the VAR methodology to examine the connection between deficits and interest rates.⁹⁵

Perotti (2002) uses a structural vector auto-regression to study the relationship between fiscal policy and a variety of economic variables, including short-term interest rates.⁹⁶ For the United States, he finds a small but statistically significant negative effect on real short-term interest rates from an increase in government purchases (Perotti, Table 6). A tax shock produces a modest, statistically significant effect on short-term interest rates for 3 years, but the effect disappears by year 5 (Perotti, Table 12). Perotti notes, however, that the results could be different for long-term interest rates (footnote 38) and that the VAR approach may ignore important information, such as CBO forecasts of budget balances (page 27). Mountford and Uhlig (2000) use a VAR and find a temporary effect, but no permanent effect, on short-term interest rates from a deficit spending shock.⁹⁷ Like Perotti, Mountford and Uhlig do not examine long-term interest rates.

⁹³ Douglas W. Elmendorf, "Actual Budget Deficits and Interest Rates," Mimeo, Department of Economics, Harvard University, March 1993.

⁹⁴ 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.

⁹⁵ Miller and Russek (1996) find significant effects of deficits on interest rates using non-VAR methodologies, but a mixed picture from VAR regressions. See Stephen M. Miller and Frank S. Russek, "Do Federal Deficits Affect Interest Rates? Evidence from Three Econometric Models," *Journal of Macroeconomics*, Summer 1996, Vol. 18, No. 3, pp. 403-428.

⁹⁶ Roberto Perotti, "Estimating the effects of fiscal policy in OECD countries," ISOM conference, Frankfurt, June 2002.

⁹⁷ Andrew Mountford and Harald Uhlig, "What are the Effects of Fiscal Policy Shocks," Centre for Economic Policy Research, October 2000, Figure 7B.

Tavares and Valkanov (2001) also estimate a VAR, but examine returns on bonds *relative to* the return on 3-month Treasury bills.⁹⁸ They find a statistically and economically significant connection with fiscal policy shifts, and their results are robust to a variety of different specifications. Tavares and Valkanov (2001) conclude that “we demonstrate empirically that the impact of fiscal policy on market returns cannot be neglected.”⁹⁹

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.¹⁰⁰ Miller and Russek (1991) show that, within a VAR-type approach, larger deficits are associated with increases in long-term interest rates.¹⁰¹

From one perspective, the VAR papers may seem to represent an improvement over many previous papers in that they at least attempt to implicitly include a measure of projected deficits in some sense. Their mechanical measure of “projected deficits” is extremely flawed in practice, however. They also appear to demonstrate one of the points made by Barth et. al. (1991): Failing to include both the long-term interest rate and the short-term interest rate tends to produce a finding of no statistical effect from deficits; including both rates or examining the spread between the two tends to suggest a significant effect. In a sense, this result is also consistent with the fact that the macro-econometric models tend to find a significant effect on long-term rates from deficits. Those models devote significant attention to trying to explain the overall level of interest rates, and therefore are capable of identifying the partial effect of larger deficits on any specific interest rate. VARs, however, typically prove incapable of explaining the overall level of interest rates particularly well.

⁹⁸ Jose Tavares and Rossen Valkanov, “The Neglected Effect of Fiscal Policy on Stock and Bond Returns,” Anderson School, UCLA, October 2001.

⁹⁹ Tavares and Valkanov (2001), page 22.

¹⁰⁰ Matthew B. Canzoneri, Robert E. Cumby, and Behzad T. Diba, “Should the European Central Bank and the Federal Reserve Be Concerned About Fiscal Policy?” presented at the Federal Reserve Bank of Kansas City’s symposium on “Rethinking Stabilization Policy,” Jackson Hole, Wyoming, August 2002, Figure 7. Canzoneri, Cumby, and Diba find a smaller effect from tax shocks.

¹⁰¹ More specifically, Miller and Russek (1991) 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. See Stephen M. Miller and Frank S. Russek, “The Temporal Causality Between Fiscal Deficits and Interest Rates,” *Contemporary Policy Issues*, Vol. IX, July 1991, pages 12-23.

Appendix 5: Papers since Barth et al. (1991)

Predominately positive significant effect	Mixed effect	Predominately insignificant effect
<i>Expected or unanticipated deficit</i>		
<ol style="list-style-type: none"> 1. Canzoneri, Cumby, and Diba (2002) 2. Thorbecke (1993) 3. Elmendorf (1993) 4. Elmendorf (1996) 5. Kitchen (1996) 	<ol style="list-style-type: none"> 1. Quigley and Porter-Hudak (1994) 2. Cohen and Garnier (1991) 	
<i>VAR-based dynamics</i>		
<ol style="list-style-type: none"> 1. Tavares and Valkanov (2001) 2. Miller and Russek (1991) 	<ol style="list-style-type: none"> 1. Perotti (2002) 2. Mountford and Uhlig (2000) 	
<i>Current deficit or debt</i>		
<ol style="list-style-type: none"> 1. Kitchen (2002) 2. Cebula and Koch (1989) 3. Cebula and Koch (1994) 4. Miller and Russek (1996) 	<ol style="list-style-type: none"> 1. Coorey (1992) 	