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COMMENT BY

VALERIE A. RAMEY This paper by Auerbach and Yagan offers important new insights on the state of US debt and deficits. First, they rigorously document something that we all suspected: Congress doesn't respond to deficits anymore. The previous work by Auerbach (2003) showed that between 1984 and 2003 Congress enacted legislation to raise the primary surplus in response to an increase in projected future deficits. The feedback was modest but nonetheless present. The current paper reestimates that feedback rule for 2004 to 2024 and finds no legislative response to projected deficits. Second, the authors highlight an important feature of the path of debt-to-GDP ratios since 2004: Crises lead to positive debt shocks that ratchet up the US debt-to-GDP ratio, but there are no corresponding negative debt shocks. Moreover, the debt-to-GDP ratio does not fall after the crisis has passed. Third, the authors explore whether various feedback rules can keep the debt path under control when there are no shocks. They estimate and simulate paths from various fiscal feedback rules, both deficit-based and debt-based. In the absence of shocks, even modest deficit or debt feedback keeps the debt ratio at sustainable levels, but with no feedback the debt ratio rises exponentially. Fourth, they generalize the model to the more realistic case in which interest rates and debt are hit by shocks, and interest rates respond to the level of debt. The simulations show the strength of feedback, either to debt or deficits, required to keep the debt-to-GDP ratio below certain values 95 percent of the time over a one-hundred-year period. The results show the post-2003 absence of feedback is unlikely to keep the debt-to-GDP ratio below levels even as high as 500 percent.

My comments consist of four parts. First, I discuss debt dynamics and how Auerbach and Yagan's fiscal rule relates to Bohn's (1998) fiscal rule. Second, I comment on several features of their stochastic model simulations. Third, I explain why I am pessimistic about spending reductions going forward. Finally, I conduct a case study of the sources of the decline in the debt-to-GDP ratio in the immediate post–World War II period and conclude that inflation accounted for the entire decline.

DEBT DYNAMICS AND FISCAL RULES It is useful to compare Auerbach and Yagan's rule to the famous Bohn (1998) rule. To begin, the debt dynamics identity specifies that

$$b_t - b_{t-1} = \left(\frac{r-g}{1+g}\right) b_{t-1} - s_t,$$

where b_t is the debt-to-GDP ratio at the end of period t, r is the real interest rate, g is the growth rate of real GDP, and s_t is the primary surplus divided by GDP. Bohn (1998) showed that if the primary surplus reacts sufficiently strongly to the level of debt, then any level of debt is sustainable. Bohn's rule is:

$$s_t = d \bullet b_{t-1} + \textit{cyclical component}.$$

The key parameter in the feedback rule is d. The cyclical component captures factors such as the procyclicality of tax revenue. With Bohn's rule, debt evolves as follows:

$$b_t - b_{t-1} = \left(\frac{r-g}{1+g} - d\right) b_{t-1} - \textit{cyclical component}.$$

Bohn showed that if $d > \dfrac{r-g}{1+g}$, then the debt ratio will never explode. He estimated the value of d over long historical US data and found that the value was sufficiently large to prevent debt ratio explosions.

In contrast, Auerbach and Yagan's baseline rule specifies that primary surpluses respond to the Congressional Budget Office (CBO) forecasts of the primary surplus-to-GDP ratio over the next five years. There is no feedback from debt in their baseline rule. This feature seems odd at first, both because debt sustainability is the focus of the analysis and standard optimal control implies that the feedback rule should depend on debt, which is the state variable.

Why did Auerbach and Yagan exclude debt from their baseline rule? Their estimates, shown in table 2 in the paper, indicate that the coefficients on the projected surplus are much more important than the coefficients on projected debt or lagged debt. This is also true for the more reactive 1984–2003 period. Is the absence of debt a problem for their rule? Not necessarily. To see this, consider the analysis above. They are essentially setting Bohn's coefficient, d, to be equal to zero in their baseline rule. However, as Bohn's results show, if interest rates are less than the growth rate of GDP, the debt ratio will not explode even with $d = 0$. Thus, Auerbach and Yagan's rule can prevent debt from exploding if the interest rate remains below the growth rate of GDP.

However, as Blanchard, Leandro, and Zettelmeyer (2021) note, the outlook is not so rosy if we consider the addition of two realistic factors: stochastic shocks and political and economic constraints on the size of primary surpluses that a government can generate. Considering the constraints, let $\bar{s}$ be the upper limit to the primary surplus. Then the maximum sustainable debt is

$$b^* = \bar{s}\left(\frac{r-g}{1+g}\right)^{-1}.$$

If $\bar{s}$ equals 1.5 percent and $\frac{r-g}{1+g}$ equals 1.5 percent, then the maximum sustainable debt is 100 percent. For stochastic shocks, the analysis becomes more complicated. That is why stochastic simulations, like the ones conducted by Auerbach and Yagan, are so important for assessing debt sustainability.

COMMENTS ON AUERBACH AND YAGAN'S STOCHASTIC SIMULATIONS In their stochastic simulations, Auerbach and Yagan consider a world in which infrequent shocks from a Poisson process hit debt, while other shocks affect the $r - g$ term. They find that both their rule using the estimated feedback from 1984 to 2003 and Bohn's estimated historical rule have a high probability of keeping the debt-to-GDP ratio under 250 percent for one hundred years. In contrast, the post-2003 lack of feedback, even augmented with sudden consolidations when the interest expense exceeds 2 percent of GDP, has much lower probability of keeping the debt-to-GDP ratio under 250 percent.

Generalizations of their model are likely to lead to even more pessimistic conclusions. I will highlight three: the frequency of the budget shocks, effects of fiscal consolidations on GDP, and the possibility of covariances between the two types of shocks.

Auerbach and Yagan parameterize the Poisson process so that the rare budget shocks hit on average twice per hundred years. For reasons I do not understand, they focus on the global financial crisis and COVID-19 pandemic but ignore the Great Depression and World War II. One has only to read the current ominous news about the global military situation or bird flu to suspect that the frequency of these rare shocks is probably at least twice as high as the authors' parameterization.

Auerbach and Yagan also omit the negative effects of fiscal consolidations on GDP, meaning that they are assuming multipliers of zero on both spending and taxes. While there is debate about the magnitudes of these multipliers, most economists do not think they are zero. Evidence from Guajardo, Leigh, and Pescatori (2014) and others suggests that multipliers on fiscal consolidations are large, above three for tax-based consolidations and around unity for spending-based consolidations. Thus, once we recognize that fiscal consolidations lower both the numerator and denominator of the debt-to-GDP ratio, we see how difficult it is to keep the debt-to-GDP ratio in a manageable range.

A third generalization worth considering is the possibility that shocks are correlated. To see why this possibility can be important, suppose news arrives of a secular decline in GDP growth, that is, g falls to a lower level. Standard models predict that there is likely to be a recession in the short run, due to the negative effects of the news on consumption and investment. This effect reduces GDP in the denominator of the debt-to-GDP ratio. But this recession is likely to lead the government to enact a deficit-financed stimulus, which raises the debt in the numerator. Although the stimulus is temporary, the debt-to-GDP ratio will not decline subsequently because the lower g leads to an increase in the $\frac{r-g}{1+g}$ term. In this scenario, Auerbach and Yagan's debt-to-GDP shock and excess interest shock are correlated. This correlation means that the risk of explosive debt paths is greater. One has only to focus on the 1930s portion of their figure 3, panel A, to see some of these forces in play: The $\frac{r-g}{1+g}$ term shoots up at the same time the government is using Keynesian stimulus to lower the unemployment rate. The worry is that fundamental shocks, such as growth slowdowns, lead to both an increase in excess interest and more demand for fiscal stimulus.

Finally, I would like to point out the implications of Auerbach and Yagan's debt-to-GDP shocks when the feedback rule imposes a zero parameter on

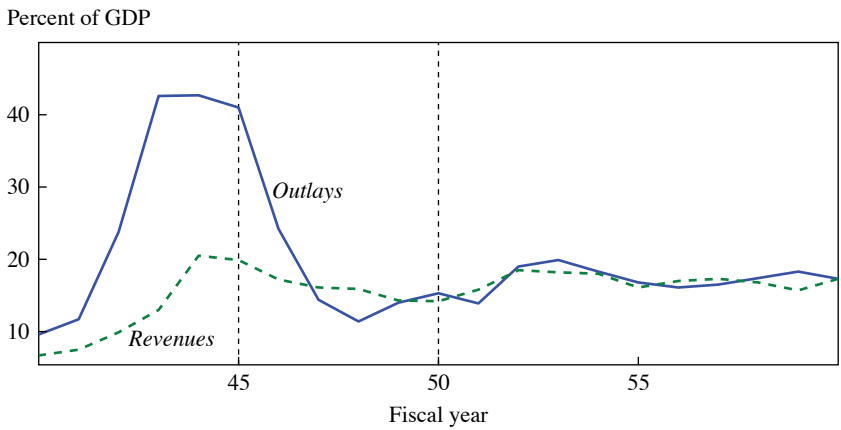
the debt-to-GDP ratio. This rule implies that the government should ignore the effects of past shocks, such as pandemics and financial crises, on the debt. Thus, their rule leads to hysteresis in the debt-to-GDP ratio whenever there are crisis shocks to the debt-to-GDP ratio, such as those during the global financial crisis and COVID-19 pandemic.

PESSIMISM ABOUT FUTURE FISCAL REACTION FUNCTIONS Auerbach and Yagan document the decline in the extent to which the government has tried to increase primary surpluses in response to high projected deficits. I am even more pessimistic going forward because of structural changes in the nature of spending.

During the twentieth century, the major forces raising the debt-to-GDP ratio were mostly temporary—military buildups, stimulus packages, and large-scale infrastructure projects. These programs led to booms in government spending for several years but then a return to normal. During the twenty-first century, two major forces raising the debt-to-GDP ratio are the aging of the population and the rise in relative health care prices. According to the CBO (2024, fig. 2-5), Social Security outlays are currently 5.2 percent of GDP in 2024 and are projected to rise to 5.9 percent by 2054 because of aging. The government's major health care programs account for 6.3 percent of GDP in 2024 and are projected to rise to almost 10 percent in 2054. Of that increase, 2.6 percent is due to cost growth and 1.2 percent is due to aging. Unless Congress makes politically difficult cuts in health care entitlements or raises taxes, the debt-to-GDP ratio will continue to rise. There is currently little political discussion about possible measures.

WHY THE DEBT-TO-GDP RATIO DECLINED IN THE IMMEDIATE AFTERMATH OF WORLD WAR II The current level of the debt-to-GDP ratio is approximately equal to its value at the end of World War II. From the post–World War II peak just over 100 percent, the ratio declined to 23 percent by the mid-1970s. Numerous commentators argued that the United States mostly grew its way out of debt, that is, the real interest rate, r, was significantly less than the growth rate, g. However, Acalin and Ball (2024) question that interpretation. Building on Hall and Sargent (2011), who highlight the importance of positive primary surpluses, and Reinhart and Sbrancia (2015), who argue that interest rates were so low only because of financial repression, Acalin and Ball (2024) carefully construct a counterfactual path of the debt-to-GDP ratio since World War II under the assumption that there were no budget surpluses and no distortions to interest rates. They find that the debt-to-GDP ratio would have fallen only to 74 percent by the mid-1970s. They also discuss the role of unanticipated inflation, though

Figure 1. Federal Revenues and Outlays



Source: Office of Management and Budget (2024).

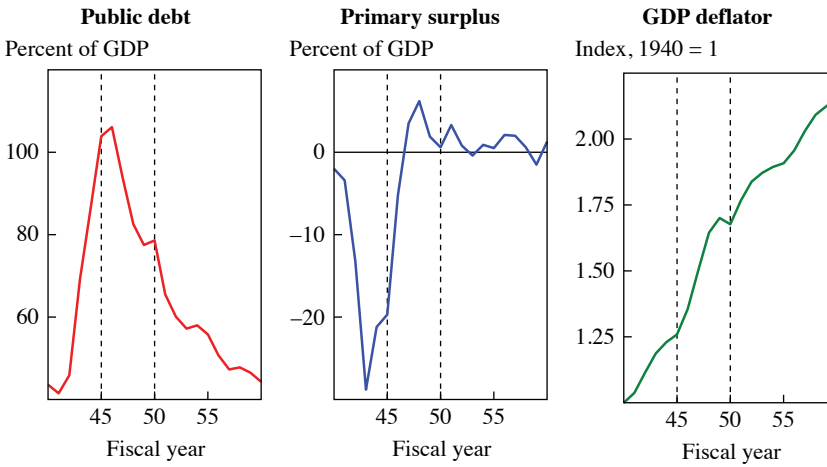
Note: All data are on a fiscal year basis. The vertical lines indicate the end of World War II (August 1945) and the start of the Korean War (June 1950).

they start their analysis in 1952 when data on inflation expectations first became available.

Here I present a case study of the spending, revenue, and the debt-to-GDP ratio in the immediate aftermath of World War II. Figure 1 shows annual data on federal government revenues and outlays as a percentage of GDP. The years shown are fiscal years; fiscal year 1950 begins July 1, 1949, and ends June 30, 1950. The first vertical line indicates the end of World War II (August 1945) and the second one indicates the start of the Korean War (June 1950). Outlays rose by about 30 percentage points of GDP in World War II and by 4.6 percentage points in the Korean War.

Figure 2 shows debt in the hands of the public, the primary surplus, and the GDP deflator. The first panel shows that the debt-to-GDP ratio fell from over 100 percent in fiscal year 1945 to 83 percent by fiscal year 1948. The second panel shows that the primary surplus moved from very negative values during World War II to strongly positive values by fiscal year 1947. The third panel shows that the price level, as measured by the GDP deflator, rose steeply between 1945 and 1948. Price controls, accompanied by rationing, kept inflation low during the war. The war ended in August 1945 and rationing of all items (except sugar) was lifted by the end of the year. In February 1946, the Office of Price Administration switched from the stricter "hold the line" price controls to adjustable price controls and in

Figure 2. Debt Dynamics: 1940–1960



Source: Office of Management and Budget (2024).
Note: All data are on a fiscal year basis.

June 1946 lifted the controls (Rockoff 1984, table 4.3). As Rockoff documents, inflation surged from February 1946 through July 1946.

The debt-to-GDP ratio fell steeply between 1945 and 1948. We can decompose that change into changes in nominal debt (*debt*), real GDP (Y), and prices (P) using the following equation:

$$\Delta \ln\left(\frac{debt}{P \bullet Y}\right) = \Delta \ln\left(debt\right) - \Delta \ln\left(Y\right) - \Delta \ln\left(P\right).$$

Table 1 shows two versions of the decomposition. In both versions, debt is measured at the end of the fiscal year, June 30. In the fiscal year version, I use the Office of Management and Budget's method of dividing debt by GDP corresponding to the fiscal year ending June 30; this is the version shown in figure 2. In the second version, I use the Bureau of Economic Analysis GDP series during the *calendar* year so that debt is measured at the midpoint of the GDP measurement.[1] Because GDP fell so much when World War II ended, there is a noticeable difference between the two methods.

1. Bureau of Economic Analysis, "Gross Domestic Product (Implicit Price Deflator)," retrieved from FRED, Federal Reserve Bank of St. Louis, https://fred.stlouisfed.org/series/A191RD3A086NBEA.

Table 1. Decomposition of Decline in Debt-to-GDP Ratio from 1945 to 1948

GDP version	$\Delta \ln\left(\frac{debt}{P \bullet Y}\right)$	$\Delta \ln(debt)$	$-\Delta \ln(Y)$	$-\Delta \ln(P)$
Fiscal year	–23%	–8%	– (–12%)	– 27%
Calendar year	–27%	–8%	– (–8%)	– 28%

Source: The fiscal year data are from the Office of Management and Budget (2024). The calendar year data on GDP and the price level are from the Bureau of Economic Analysis.

The decline in the debt-to-GDP ratio is 23 percent if I divide by fiscal year GDP and 27 percent if I divide by calendar year GDP. The difference is entirely due to the behavior of real GDP—fiscal year GDP fell 12 percent whereas calendar year GDP fell 8 percent. Both of these estimates of the real GDP decline completely offset the effect of the 8 percent fall in nominal debt on the debt ratio. In contrast, the price level's rise of 27 percent (28 percent) accounts for all or more of the decline in the debt-to-GDP ratio. Thus, the burst in inflation was the dominant factor leading to the decline in the debt-to-GDP ratio in the three years after the end of World War II. Interest rates did not rise in response only because the US government was engaging in financial repression.

The Korean War began only five years later, generating a significant rise in government outlays not only for the "hot war" but also for the Cold War. While the rise shown in figure 1 looks small compared to World War II, it dwarfs the subsequent increases for the Vietnam War or the Carter-Reagan buildup. However, primary surpluses did not turn negative because the US government financed the Korean War with tax increases (Ohanian 1997). Neither President Harry Truman nor the Congress wanted to allow the new military spending needs to derail the progress made against the debt.

CONCLUSIONS In sum, Auerbach and Yagan's paper presents thought-provoking new estimates of fiscal rules in practice in the United States and an analysis of the likely consequences for the future of the debt-to-GDP ratio. This paper should give pause to even the most ardent debt optimist.

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GENERAL DISCUSSION Jón Steinsson observed that the US debt-to-GDP ratio has consistently risen in times of war and subsequently comes back down. He pointed to the markedly different experience of the United Kingdom, explaining that their debt-to-GDP ratio increased steadily from 1700 to 1815 after which it proceeded to decrease for the next hundred years.[1] Steinsson argued that this was an example of a case where the debt-to-GDP ratio could look very ill-behaved for a very long time before reversing course and being brought back under control. He stated that he was concerned about the evolution of the debt-to-GDP ratio in the United States, but that it was hard to make strong inference about this series with short samples.

Jason Furman remarked that while many economists were worried about the debt-to-GDP ratio when it was as low as 35 percent of GDP, it is now

1. Luke Lanskey and Conor O'Loughnan, "300 Years of UK Public Finance Data," UK Office for Budget Responsibility, July 20, 2023, https://articles.obr.uk/300-years-of-uk-public-finance-data/index.html.