The Growth Dividend and Excess Interest

Danny Yagan, *University of California, Berkeley and NBER,* United States of America

Executive Summary

Standard deficit accounting neglects the growth dividend: the amount by which annual gross domestic product (GDP) growth shrinks the debt-GDP ratio. America's growth dividend has more than doubled since the Great Recession because the debt ratio has more than doubled, leading to headline deficits that far exceed changes in the debt ratio. Each year's change in the debt ratio can be decomposed into three components: the primary deficit (non-interest spending minus tax revenue), interest payments, and the growth dividend. The sum of the latter two is excess interest: the impact of past debt on the debt ratio, roughly equal to last year's debt ratio times the excess interest rate $(r - g)/(1 + g)$ where r is the average nominal interest rate on federal debt and g is the nominal GDP growth rate. Excess interest remains slightly negative in the Congressional Budget Office's (CBO) baseline 10-year projection. Hence, current debt is sustainable in the CBO baseline despite high interest payments, and primary deficits entirely drive the unsustainable projected debt ratio path and provide a good guide for how the debt ratio is projected to change. However, America's higher debt ratio implies higher vulnerability to the risk that the excess interest rate turns persistently positive.

I. Introduction

Mirroring numerous policy makers and commentators, the *Wall Street Journal* Editorial Board recently used the deficit to try to explain the February

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2024 Congressional Budget Office's (CBO) 10-year projection of America's debt-GDP (gross domestic product) ratio:

> Debt as a share of GDP will rise to 116% in 2034 from 97.3%. . . . Revenues are expected to average 17.8% of GDP through 2034. . . . The problem is that spending over the next decade will average 23.5% of GDP. (*Wall Street Journal* Editorial Board 2024)

Such quotes raise a puzzle. If the deficit will average 6% of GDP per year (24% minus 18%) over the next 10 years, then why will the debt-GDP ratio rise by only 19 percentage points instead of by 60 percentage points (6% per year times 10 years)?

The disconnect between the deficit and the debt ratio change has grown over time. Figure 1 chooses two example time periods: the pre–Great Recession years 2003–7, using historical data from CBO (2024b), and the coming decade 2025–34, using the June 2024 CBO outlook (CBO 2024c). Before the Great Recession, the average deficit was approximately 2.5% of GDP, and the debt rose by only 0.5% of GDP, a difference of

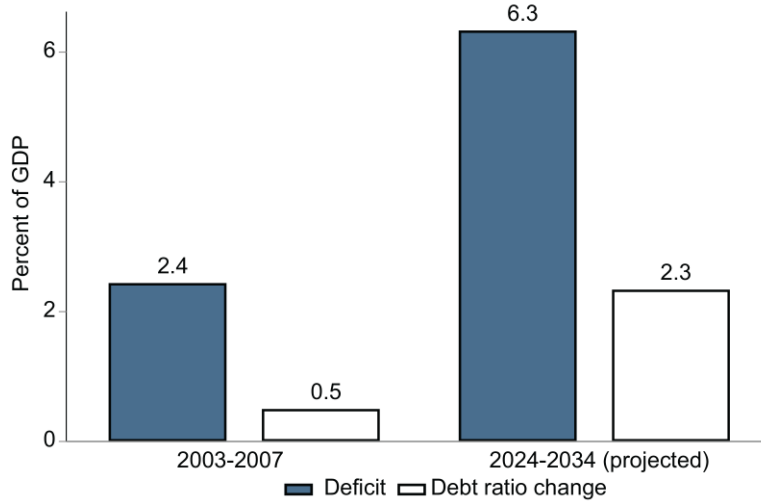

Fig. 1. The deficit increasingly exceeds the change in the debt-GDP ratio. This graph plots the deficit as a percentage of GDP and the change in the debt-GDP ratio for select time periods. The deficit equals the primary deficit plus net interest. The change in the debt-GDP ratio equals the debt-GDP ratio at the end of the year, minus the debt-GDP ratio at the end of the prior year. Panel B plots evenly weighted averages of annual values. Historical data are from CBO (2024b), which is derived from Office of Management and Budget (OMB) historical tables. Next-decade projections are from CBO (2024c).

2% of GDP. Over the coming decade, the CBO projects that the deficit will be approximately 6% of GDP but that debt will rise by only approximately 2% of GDP, a difference of 4% of GDP. The deficit exceeds the debt ratio change in both periods, but the excess is projected to be twice as large over the next decade as it was before the Great Recession.

This article explains why, by mapping the debt ratio law of motion to the quantities commonly used in budget policy analysis. Aside from usually minor miscellaneous transactions, each year's change in the debt ratio equals the deficit plus what Bohn (2008) termed the growth dividend: the amount by which nominal GDP growth reduces the debt ratio. The growth dividend equals the prior year's debt ratio times $-g/(1+g)$ where g is the nominal GDP growth rate. When the debt ratio was only 50%, nominal GDP growth of 4% implies that the deficit exceeds the debt ratio change by about 2% of GDP, equal to $50\% \times (-0.04/[1+0.04])$.[1] Now that the debt ratio is approximately 100%, nominal GDP growth of 4% implies that the deficit exceeds the debt ratio change by about 4% of GDP, equal to $100\% \times (-0.04/[1+0.04])$.

Both interest payments and the growth dividend are proportional to the debt ratio. If the primary deficit (non-interest spending minus tax revenue) was zero, the debt ratio would change only because we have past debt. Interest payments plus the growth dividend equals the amount by which past debt grows on itself, a quantity I call excess interest.[2] Excess interest equals last year's debt ratio times what I call the excess interest rate $(r-g)/(1+g)$—economists' key "$r-g$" term—except for the usually minor interest paid or saved during the current year due to a primary deficit or surplus.

Adding a growth dividend row to CBO's 10-year outlook table enables readers to exactly decompose America's unsustainable fiscal path. As Blanchard (2019) emphasizes in terms of the excess interest rate, excess interest remains slightly negative in CBO's outlook and implies that the debt ratio would fall if the primary budget were balanced. That fact is true despite net interest payments being large, because the growth dividend is slightly larger: 3.7% of GDP average interest versus –4.0% of GDP average growth dividend. Near-zero excess interest implies that the average debt ratio change approximately equals the average primary deficit.

CBO projects that the rising debt ratio will steadily increase the excess interest rate, such that it turns positive in 2040. The only reason that the debt ratio rises in CBO's projections before 2040 involves primary deficits. If the primary budget were balanced, CBO would project a declining debt ratio forever. Therefore, America's unsustainable fiscal path

according to CBO projections is caused entirely by large ongoing primary deficits, despite currently high interest payments.

These facts suggest nuance around the recent emphasis on interest payments, such as the following quote from the *New York Times* Editorial Board:

> Borrowing is expensive. A mounting share of federal revenue, money that could be used for the benefit of the American people, goes right back out the door in the form of interest payments to investors who purchase government bonds. Rather than collecting taxes from the wealthy, the government is paying the wealthy to borrow their money. By 2029, the government is on pace to spend more each year on interest than on national defense. (*New York Times* Editorial Board 2023)

It would be equally true to remark that "the government now enjoys a growth dividend greater than its spending on national defense," as both interest payments and the growth dividend have grown with the debt ratio since the mid-2000s. Excess interest—the net amount by which past debt increases the debt ratio—has not increased since the mid-2000s and remains slightly negative. By focusing on interest payments and not excess interest, policy makers and commentators risk missing the fact that America's unsustainable fiscal path in the CBO baseline is driven entirely by large ongoing primary deficits that are entirely under policy makers' control.

However, the CBO baseline projection is not a risk scenario. America's more-than-doubled debt ratio means that America is more than twice as vulnerable to the risk that the excess interest rate rises to any given positive value, such as the positive values that prevailed during most of the 1980–2000 period. The more-than-doubled debt ratio means that any given positive value of the excess interest rate will result in past debt adding more than twice as much to the debt ratio as it would have before the Great Recession. Economists have attempted to quantify such risk scenarios (e.g., Ball, Elmendorf, and Mankiw 1998; Blanchard 2019; Mehrotra and Sergeyev 2021; Auerbach and Yagan 2024).

The substance of this note is already obvious to economists and budget experts (e.g., Hall and Sargent 2011; Auerbach and Gale 2023; Blanchard 2023; Goldwein 2023). However, there has been a disconnect between economists and budget experts on the one hand and policy makers and commentators on the other. Economists and budget experts often operate in continuous time and with real (inflation-adjusted) quantities that combine interest and the growth dividend into a single term to focus on debt ratio sustainability. In contrast, Congress operates in discrete time and

with nominal quantities that include interest but not the growth dividend: reconciliation bills such as the 2017 Tax Cuts and Jobs Act and the 2021 American Rescue Plan Act have nominal dollar limits to cumulative 10-year deficit impacts, and the debt limit is expressed as a nominal dollar amount. This article bridges the presentational divide by keeping nominal interest separate and simply adding the growth dividend as a separate line to exactly decompose debt ratio changes using CBO quantities.

Section II details debt-GDP dynamics in nominal terms and maps them to CBO quantities. Section III adds a growth dividend row to CBO's budget outlook table to exactly decompose debt ratio changes. Section IV compares net interest to the growth dividend to determine whether current US debt would be sustainable under zero future primary deficits. Section V uses hypothetical economies to convey the intuition for why excess interest and not interest communicate the effect of past debt on the debt ratio. Section VI discusses sustainability risk. Section VII discusses real net interest. Section VIII concludes.

II. Debt-GDP Dynamics Mapped to CBO Nominal Annual Quantities

Debt held by the public grows from the end of year $t-1$ to the end of year t according to the accounting identity:

$$\underbrace{\text{DEBT}_t - \text{DEBT}_{t-1}}_{\text{Debt change}} = \underbrace{\underbrace{\text{NONINTERESTOUTLAYS}_t - \text{REVENUES}_t}_{\text{Primary deficit}} + \underbrace{r_t \times \text{DEBT}_{t-1}}_{\text{Net interest}}}_{\text{Deficit}}, \quad (1)$$

where r_t is the average nominal interest rate on government debt.

All terms in equation (1) are nominal (i.e., not inflation adjusted) and are exactly as they appear in CBO's main budget table. The deficit in year t is defined as the change in debt from the end of year $t-1$ to the end of year t. The primary deficit in year t is defined as outlays other than net interest, minus revenues. The deficit equals the primary deficit plus net interest.

Dividing equation (1) through GDP and rearranging terms, one obtains the following accounting identity for the change in the debt ratio as in Bohn (2008):

$$\underbrace{\frac{\text{DEBT}_t}{\text{GDP}_t} - \frac{\text{DEBT}_{t-1}}{\text{GDP}_{t-1}}}_{\text{Debt ratio change}} = \underbrace{\underbrace{\frac{\text{NONINTERESTOUTLAYS}_t}{\text{GDP}_t} - \frac{\text{REVENUES}_t}{\text{GDP}_t}}_{\text{Primary deficit}} + \underbrace{\frac{r_t \times \text{DEBT}_{t-1}}{\text{GDP}_t}}_{\text{Net interest}}}_{\text{Deficit}} + \underbrace{\frac{-g_t}{1+g_t} \times \frac{\text{DEBT}_{t-1}}{\text{GDP}_{t-1}}}_{\text{Growth dividend}}, \tag{2}$$

where $g_t = (\text{GDP}_t/\text{GDP}_{t-1}) - 1$ is the nominal growth rate of GDP.[3]

The unfamiliar term is the growth dividend: $-g_t/(1+g_t)$ times the prior year's debt ratio. The reason that one needs the growth dividend term in the debt ratio change equation (2) and not the debt change equation (1) is that the debt ratio divides the debt by GDP, which grows by the rate of economic growth and thereby reduces the debt ratio. The growth dividend equals the percentage points of GDP by which the debt ratio would fall if the deficit were zero.

Equation (2) illuminates that past debt DEBT_{t-1} appears in both the net interest term and the growth dividend term. Hence, the equation can be rearranged to separate the DEBT_{t-1} terms from the primary deficit, which maximizes comparability with CBO tables:

$$\underbrace{\frac{\text{DEBT}_t}{\text{GDP}_t} - \frac{\text{DEBT}_{t-1}}{\text{GDP}_{t-1}}}_{\text{Debt ratio change}} = \underbrace{\frac{\text{NONINTERESTOUTLAYS}_t}{\text{GDP}_t} - \frac{\text{REVENUES}_t}{\text{GDP}_t}}_{\text{Primary deficit}} + \underbrace{\underbrace{\frac{r_t \times \text{DEBT}_{t-1}}{\text{GDP}_t}}_{\text{Net interest}} + \underbrace{\frac{-g_t}{1+g_t} \times \frac{\text{DEBT}_{t-1}}{\text{GDP}_{t-1}}}_{\text{Growth dividend}}}_{\text{Excess interest}}. \tag{3}$$

Excess interest—which equals interest plus the growth dividend—is the net effect of debt on the debt ratio. The equation shows that if DEBT_{t-1} were zero, the debt ratio change would equal the primary deficit.

Holding fixed r_t and g_t, a rise in the debt ratio increases net interest and the growth dividend exactly in tandem. This fact can be seen especially easily when expressing net interest in terms of the prior year's debt ratio and combining terms:

$$\underbrace{\frac{\text{DEBT}_t}{\text{GDP}_t} - \frac{\text{DEBT}_{t-1}}{\text{GDP}_{t-1}}}_{\text{Debt ratio change}} = \underbrace{\frac{\text{NONINTERESTOUTLAYS}_t}{\text{GDP}_t} - \frac{\text{REVENUES}_t}{\text{GDP}_t}}_{\text{Primary deficit}} + \underbrace{\underbrace{\frac{r_t - g_t}{1 + g_t}}_{\text{Excess interest rate}} \times \underbrace{\frac{\text{DEBT}_{t-1}}{\text{GDP}_{t-1}}}_{\text{Prior year's debt ratio}}}_{\text{Excess interest}} . \tag{4}$$

For example, suppose that r_t and g_t remain fixed, and suppose that the debt ratio more than doubles as it has in the United States. Equation (4) makes clear that both net interest and the growth dividend will more than double. The sign of the net effect of past debt on the debt ratio will not change as it is determined only by $r_t - g_t$. Equation (4) is the representation of the debt ratio law of motion utilized in Auerbach and Yagan (2024).

The appendix derives the exact true version, which contains two additional minor terms. First, "other means of financing" in year t as a share of GDP in year t must be added to each equation (2)–(4). Other means of financing include miscellaneous transactions that affect borrowing from the public, such as changes in the Treasury's operating cash balance when avoiding the debt ceiling.[4]

Second, equations (2)–(4) must include interest on incremental debt due to the current-year primary deficit. For example, a primary deficit in January leads the government to issue incremental debt in January, which generates net interest in February. CBO defines net interest to include all interest paid during the current fiscal year, including interest due to the current primary deficit. As a result, representations of net interest using the interest rate $r_t \times \text{DEBT}_{t-1}/\text{GDP}_t$ and of excess interest using the excess interest rate $(r_t - g_t)/(1 + g_t) \times (\text{DEBT}_{t-1}/\text{GDP}_{t-1})$ are not exact unless one uses an unintuitive representation of the interest rate r_t such that $r_t \times \text{DEBT}_{t-1}$ includes interest on incremental debt due to the current-year primary deficit.

In the exact decompositions below, I therefore utilize net interest directly from CBO and compute excess interest as CBO net interest plus the growth dividend $-g_t/(1 + g_t) \times (\text{DEBT}_{t-1}/\text{GDP}_{t-1})$. Specifically, tables 1–2 and figure 2 exactly decompose each year's change in the debt ratio into the following terms:

Table 1
CBO's Baseline Budget Projections Table, with Exact Decomposition of the Debt-GDP Ratio Change

	Actual												Total	
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2025–29	2025–34
	In Billions of Dollars													
Memorandum:														
Gross Domestic Product	26,974	28,467	29,711	30,856	31,972	33,115	34,346	35,654	37,018	38,432	39,890	41,398	160,000	352,392
	As a Percentage of Gross Domestic Product													
Revenues:														
Individual income taxes	8.1	8.6	8.6	9.2	9.8	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.4	9.6
Payroll taxes	6.0	5.9	5.8	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
Corporate income taxes	1.6	1.8	1.6	1.5	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.5	1.3
Other	.9	.8	.9	.9	.9	.9	.9	.9	1.1	1.1	1.1	1.2	.9	1.0
Total	16.5	17.2	17.0	17.5	18.0	18.0	17.9	17.8	18.0	18.0	18.0	18.0	17.7	**17.8**
On-budget	12.0	12.8	12.6	13.1	13.7	13.6	13.5	13.5	13.6	13.6	13.6	13.7	13.3	13.5
Off-budget	4.4	4.4	4.3	4.3	4.4	4.4	4.4	4.4	4.4	4.4	4.3	4.3	4.4	4.4
Outlays:														
Mandatory	13.9	14.5	13.9	13.9	14.0	14.4	14.1	14.6	14.7	14.9	15.5	15.3	14.1	14.6
Discretionary	6.4	6.3	6.2	6.2	6.1	6.0	5.9	5.8	5.7	5.6	5.6	5.5	6.1	5.8
Net Interest	2.4	3.1	3.4	3.4	3.4	3.4	3.5	3.6	3.7	3.9	4.0	4.1	3.4	3.7
Total	22.7	23.9	23.5	23.5	23.5	23.8	23.5	24.0	24.2	24.4	25.1	24.9	23.6	24.1
On-budget	18.2	19.3	18.7	18.6	18.5	18.7	18.3	18.7	18.8	18.9	19.5	19.3	18.6	18.8
Off-budget	4.5	4.6	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.6	5.0	5.3

Deficit:	–6.3	–6.7	–6.5	–6.0	–5.5	–5.9	–5.7	–6.2	–6.2	–6.5	–7.1	–6.9	–5.9	–6.3
On-budget	–6.2	–6.5	–6.1	–5.5	–4.9	–5.1	–4.8	–5.2	–5.1	–5.3	–5.9	–5.6	–5.3	–5.4
Off-budget	–.1	–.3	–.4	–.5	–.6	–.7	–.8	–.9	–1.0	–1.1	–1.2	–1.3	–.6	–.9
Primary Deficit	–3.8	–3.6	–3.1	–2.6	–2.1	–2.4	–2.2	–2.6	–2.5	–2.6	–3.1	–2.8	–2.5	–2.6
Debt Held by the Public	97.3	99.0	101.6	104.1	106.2	108.6	110.5	112.7	114.8	117.1	119.9	122.4	n.a.	n.a.
Change in Debt Held by the Public:	1.4	1.7	2.6	2.5	2.1	2.4	1.9	2.2	2.1	2.3	2.7	2.5	2.3	2.3
Primary Deficit	3.8	3.6	3.1	2.6	2.1	2.4	2.2	2.6	2.5	2.6	3.1	2.8	2.5	2.6
Net Interest	2.4	3.1	3.4	3.4	3.4	3.4	3.5	3.6	3.7	3.9	4.0	4.1	3.4	3.7
Growth Dividend	–5.9	–5.1	–4.1	–3.8	–3.6	–3.7	–3.9	–4.1	–4.2	–4.2	–4.3	–4.4	–3.8	–4.0
Other Means of Financing	1.1	.1	.2	.3	.2	.2	.2	.1	.1	.0	.0	.0	.2	.1

Note: This table adds one line—the "Growth Dividend"—to CBO's Table 1–1 to exactly decompose CBO's projected changes in the debt-GDP ratio. "Change in Debt Held by the Public" equals each year's value of "Debt Held by the Public" minus the prior year's. (The negative of) "Primary Deficit" and "Net Interest" equal their labeled rows above. "Other Means of Financing" comes from CBO Table 1–3. The "Growth Dividend" equals $-g/(1+g)$ times the prior year's "Debt Held by the Public," where g equals the growth rate of nominal GDP.

Table 2
Exact Decomposition of Debt Ratio Changes 1980–2034

Year	Debt–GDP Ratio (% of GDP)	Change in Debt–GDP Ratio (pp of GDP)	Deficit			Other Means of Financing (% of GDP)
			Primary Deficit (% of GDP)	Excess Interest		
				Net Interest (% of GDP)	Growth Dividend (% of GDP)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1980	25.5	.5	.8	1.9	–2.0	–.1
1981	25.2	–.3	.3	2.2	–2.8	.0
1982	27.9	2.7	1.3	2.6	–1.4	.2
1983	32.2	4.3	3.3	2.5	–1.8	.1
1984	33.1	.9	1.9	2.8	–3.4	–.4
1985	35.3	2.2	1.9	3.0	–2.5	–.3
1986	38.5	3.1	1.9	3.0	–2.0	.3
1987	39.6	1.2	.2	2.9	–1.9	.0
1988	39.9	.3	.1	3.0	–2.9	.1
1989	39.4	–.5	–.3	3.0	–3.0	–.2
1990	40.9	1.4	.6	3.1	–2.3	.0
1991	44.1	3.2	1.2	3.2	–1.3	.1
1992	46.8	2.6	1.4	3.1	–2.2	.3
1993	47.9	1.2	.8	2.9	–2.5	–.1
1994	47.8	–.1	.0	2.8	–2.7	–.3
1995	47.7	–.2	–.9	3.1	–2.4	.1
1996	47.0	–.7	–1.7	3.0	–2.3	.3
1997	44.6	–2.3	–2.6	2.9	–2.8	.2
1998	41.7	–3.0	–3.5	2.7	–2.4	.2
1999	38.3	–3.3	–3.7	2.4	–2.4	.4
2000	33.7	–4.6	–4.5	2.2	–2.4	.1
2001	31.5	–2.2	–3.2	2.0	–1.3	.4
2002	32.7	1.2	–.1	1.6	–.9	.6
2003	34.7	2.0	2.0	1.4	–1.3	.0
2004	35.7	1.0	2.1	1.3	–2.2	–.3
2005	35.8	.1	1.0	1.4	–2.3	–.2
2006	35.4	–.4	.2	1.7	–2.1	–.1
2007	35.2	–.2	–.5	1.7	–1.7	.3
2008	39.2	4.0	1.4	1.7	–1.2	2.1
2009	52.2	12.9	8.5	1.3	.9	2.3
2010	60.6	8.4	7.4	1.3	–1.5	1.2
2011	65.5	4.9	6.9	1.5	–2.3	–1.2
2012	70.0	4.5	5.3	1.4	–2.6	.5
2013	71.8	1.8	2.7	1.3	–2.4	.1
2014	73.3	1.5	1.5	1.3	–3.1	1.8
2015	72.2	–1.1	1.2	1.2	–3.0	–.6
2016	76.0	3.8	1.8	1.3	–1.8	2.5
2017	75.7	–.3	2.1	1.4	–2.9	–.9
2018	77.1	1.4	2.2	1.6	–3.9	1.5
2019	79.0	1.9	2.9	1.8	–3.0	.3

Table 2
Continued

Year	Debt–GDP Ratio (% of GDP)	Change in Debt–GDP Ratio (pp of GDP)	Deficit			Other Means of Financing (% of GDP)
			Primary Deficit (% of GDP)	Excess Interest		
				Net Interest (% of GDP)	Growth Dividend (% of GDP)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2020	98.7	19.7	13.1	1.6	–.1	5.1
2021	97.1	–1.6	10.6	1.5	–7.1	–6.6
2022	95.8	–1.3	3.6	1.9	–9.1	2.3
2023	97.3	1.4	3.8	2.4	–5.9	1.1
2024	*99.0*	*1.7*	*3.6*	*3.1*	*–5.1*	*.1*
2025	*101.6*	*2.6*	*3.1*	*3.4*	*–4.1*	*.2*
2026	*104.1*	*2.5*	*2.6*	*3.4*	*–3.8*	*.3*
2027	*106.2*	*2.1*	*2.1*	*3.4*	*–3.6*	*.2*
2028	*108.6*	*2.4*	*2.4*	*3.4*	*–3.7*	*.2*
2029	*110.5*	*1.9*	*2.2*	*3.5*	*–3.9*	*.2*
2030	*112.7*	*2.2*	*2.6*	*3.6*	*–4.1*	*.1*
2031	*114.8*	*2.1*	*2.5*	*3.7*	*–4.2*	*.1*
2032	*117.1*	*2.3*	*2.6*	*3.9*	*–4.2*	*.0*
2033	*119.9*	*2.7*	*3.1*	*4.0*	*–4.3*	*.0*
2034	*122.4*	*2.5*	*2.8*	*4.1*	*–4.4*	*.0*

Note: This table exactly decomposes annual changes in the debt-GDP ratio over fiscal years 1980–2023, as well as CBO's projected changes for 2024–34 in italics. Change in debt-GDP ratio equals the current year's debt-GDP ratio minus the prior year's. Change in debt-GDP ratio also equals primary deficit plus net interest plus growth dividend plus other means of financing.

$$\underbrace{\frac{\text{DEBT}_t}{\text{GDP}_t}-\frac{\text{DEBT}_{t-1}}{\text{GDP}_{t-1}}}_{\text{Debt ratio change}}=\frac{\text{PRIMARYDEFICIT}_t}{\text{GDP}_t}+\underbrace{\frac{\text{NETINTEREST}_t}{\text{GDP}_t}+\underbrace{\frac{-g_t}{1+g_t}\times\frac{\text{DEBT}_{t-1}}{\text{GDP}_{t-1}}}_{\text{Growth dividend}}}_{\text{Excess interest}}+\frac{\text{OTHERMEANS}_t}{\text{GDP}_{t-1}}, \tag{5}$$

where OTHERMEANS_t denotes other means of financing and where every quantity in this equation is taken directly from CBO.

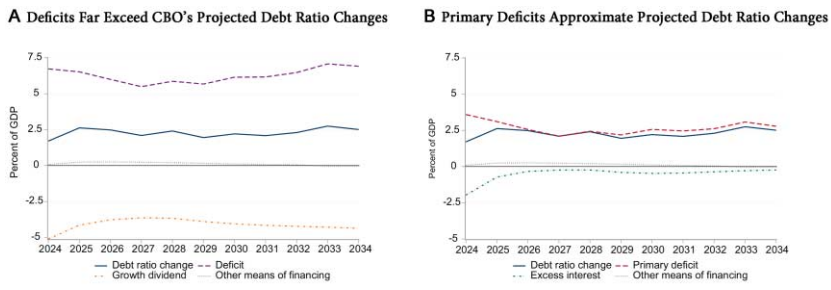

Fig. 2. The primary deficit, not the deficit, approximates CBO's projected debt ratio changes. These graphs use table 1's values from CBO's latest 10-year budget outlook (CBO 2024c) to decompose each year's debt-GDP ratio change into constituent components that exactly sum to the debt-GDP ratio change. In each panel, the debt ratio change series equals the sum of the other series. Panel A combines the primary deficit series and the net interest series into a single deficit series. Panel B combines net interest and the growth dividend into a single excess interest series.

III. Adding the Growth Dividend to CBO's Budget Outlook Exactly Decomposes Each Year's Debt Ratio Change

Table 1 uses equation (5) to reprint the main CBO budget outlook table and adds a growth dividend row, which enables the bottom five rows to exactly decompose each year's debt ratio change. The row "change in debt held by the public" equals the sum of the bottom four rows: "primary deficit," "net interest," "growth dividend," and "other means of financing." "Change in debt held by the public" equals the year's value of "debt held by the public" minus the prior year's value. "Primary deficit" is the (negative of) the so-labeled row above. "Net interest" is copied from above. "Growth dividend" equals the prior year's "debt held by the public" (i.e., the debt-GDP ratio) times $-g/(1+g)$, where g is CBO's assumed nominal GDP growth rate (3.8% on average 2025–34). Finally, "other means of financing" comes from CBO Table 1–3 and is usually near zero, and CBO projects that it goes to zero by the end of the decade.[5]

For example, consider 2025, outlined in thick black. The deficit is projected to be 6.5% of GDP, equal to the sum of a 3.1% of GDP primary deficit and 3.4% of GDP in interest payments. However, the debt ratio is projected to increase in 2024 by only 2.6% of GDP, from 99.0% to 101.6%. The reason that the debt ratio change is so much lower than the deficit is the growth dividend. The projected growth dividend for 2025 is –4.1% of GDP, equal to the prior year's debt ratio 99.0% times $-0.044/(1+0.044)$ where 4.4% is CBO's projected 2025 nominal GDP

Table 3
Excess Interest and Excess Interest Rate 1980–2034

Year	Debt–GDP Ratio (% of GDP)	Excess Interest (% of GDP)	Net Interest (% of GDP)	Growth Dividend (% of GDP)	Excess Interest Rate $(r_t - g_t)/(1 + g_t)$ (%)	Nominal Interest Rate r_t (%)	Nominal GDP Growth Rate g_t (%)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1980	25.5	–.1	1.9	–2.0	–.7	8.1	8.8
1981	25.2	–.6	2.2	–2.8	–2.3	9.6	12.2
1982	27.9	1.2	2.6	–1.4	4.5	10.5	5.7
1983	32.2	.8	2.5	–1.8	2.3	9.1	6.7
1984	33.1	–.6	2.8	–3.4	–2.0	9.5	11.7
1985	35.3	.6	3.0	–2.5	1.5	9.6	8.0
1986	38.5	1.0	3.0	–2.0	2.5	8.8	6.1
1987	39.6	1.0	2.9	–1.9	2.5	7.9	5.3
1988	39.9	.1	3.0	–2.9	.2	8.0	7.8
1989	39.4	.1	3.0	–3.0	.2	8.3	8.1
1990	40.9	.8	3.1	–2.3	2.0	8.3	6.2
1991	44.1	1.9	3.2	–1.3	4.5	7.9	3.3
1992	46.8	.9	3.1	–2.2	1.9	7.3	5.3
1993	47.9	.5	2.9	–2.5	.9	6.6	5.6
1994	47.8	.1	2.8	–2.7	.3	6.2	5.9
1995	47.7	.6	3.1	–2.4	1.4	6.8	5.3
1996	47.0	.7	3.0	–2.3	1.6	6.8	5.2
1997	44.6	.1	2.9	–2.8	.4	6.7	6.3
1998	41.7	.3	2.7	–2.4	.9	6.7	5.7
1999	38.3	.0	2.4	–2.4	.3	6.5	6.1
2000	33.7	–.2	2.2	–2.4	–.2	6.6	6.7
2001	31.5	.7	2.0	–1.3	2.2	6.4	4.0
2002	32.7	.7	1.6	–.9	2.2	5.2	2.9
2003	34.7	.1	1.4	–1.3	.0	4.2	4.2
2004	35.7	–.8	1.3	–2.2	–2.5	4.0	6.6
2005	35.8	–.8	1.4	–2.3	–2.4	4.2	6.7
2006	35.4	–.4	1.7	–2.1	–1.2	4.9	6.2
2007	35.2	.0	1.7	–1.7	.0	4.9	4.9
2008	39.2	.5	1.7	–1.2	1.4	4.9	3.4
2009	52.2	2.2	1.3	.9	5.3	2.9	–2.2
2010	60.6	–.1	1.3	–1.5	–.4	2.4	2.9
2011	65.5	–.8	1.5	–2.3	–1.4	2.4	3.9
2012	70.0	–1.2	1.4	–2.6	–2.0	2.1	4.2
2013	71.8	–1.1	1.3	–2.4	–1.6	1.9	3.6
2014	73.3	–1.7	1.3	–3.1	–2.4	1.9	4.4
2015	72.2	–1.7	1.2	–3.0	–2.4	1.7	4.2
2016	76.0	–.6	1.3	–1.8	–.8	1.8	2.6
2017	75.7	–1.5	1.4	–2.9	–2.0	1.8	3.9
2018	77.1	–2.3	1.6	–3.9	–3.1	2.2	5.5
2019	79.0	–1.3	1.8	–3.0	–1.7	2.3	4.1
2020	98.7	1.6	1.6	–.1	1.8	1.9	.1
2021	97.1	–5.5	1.5	–7.1	–5.7	1.6	7.7
2022	95.8	–7.2	1.9	–9.1	–7.5	2.1	10.3

Table 3
Continued

Year	Debt–GDP Ratio (% of GDP)	Excess Interest (% of GDP)	Net Interest (% of GDP)	Growth Dividend (% of GDP)	Excess Interest Rate $(r_t - g_t)/(1 + g_t)$ (%)	Nominal Interest Rate r_t (%)	Nominal GDP Growth Rate g_t (%)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2023	97.3	–3.5	2.4	–5.9	–3.7	2.7	6.6
2024	*99.0*	*–2.0*	*3.1*	*–5.1*	*–2.1*	*3.3*	*5.5*
2025	*101.6*	*–.7*	*3.4*	*–4.1*	*–.8*	*3.5*	*4.4*
2026	*104.1*	*–.3*	*3.4*	*–3.8*	*–.4*	*3.5*	*3.9*
2027	*106.2*	*–.2*	*3.4*	*–3.6*	*–.3*	*3.3*	*3.6*
2028	*108.6*	*–.2*	*3.4*	*–3.7*	*–.3*	*3.3*	*3.6*
2029	*110.5*	*–.4*	*3.5*	*–3.9*	*–.4*	*3.3*	*3.7*
2030	*112.7*	*–.5*	*3.6*	*–4.1*	*–.5*	*3.3*	*3.8*
2031	*114.8*	*–.4*	*3.7*	*–4.2*	*–.4*	*3.4*	*3.8*
2032	*117.1*	*–.4*	*3.9*	*–4.2*	*–.4*	*3.4*	*3.8*
2033	*119.9*	*–.3*	*4.0*	*–4.3*	*–.3*	*3.5*	*3.8*
2034	*122.4*	*–.2*	*4.1*	*–4.4*	*–.2*	*3.5*	*3.8*

Note: This table lists excess interest components over fiscal years 1980–2023, as well as CBO's projected changes for 2024–34 in italics. The debt-GDP ratio, net interest, and growth dividend columns are reprinted from table 2. Excess interest equals net interest plus growth dividend. The average nominal interest rate on federal debt equals current-year net interest, divided by the prior year's debt held by the public plus half of the current year's primary deficit, which is a simple way to account for interest paid on new debt from current-year primary imbalance (Auerbach and Gale 2023). The excess interest rate equals the nominal interest rate minus the nominal GDP growth rate, divided by one plus the nominal GDP growth rate. Net interest does not exactly equal nominal interest rate times the prior year's debt-GDP ratio, and excess interest does not exactly equal excess interest rate times the prior year's debt-GDP ratio, due to interest accumulating on new debt from current-year primary imbalance; see Section II.

growth rate.[6] Adding 6.5%, –4.1% and 0.2% in "Other Means of Financing" exactly equals the 2.6% of GDP rise in the debt ratio.

The average values over the 2025–34 period, also outlined in thick black, explain the introduction's apparent puzzle of how the debt ratio is projected to rise each year this decade by approximately one-third of the deficit. The average deficit over the 2025–34 period equals 6.3% of GDP, equal to the sum of an average 2.6% primary deficit and an average of 3.7% of GDP in interest payments. However, the debt ratio is projected to increase by only 2.3% of GDP per year, from 99% to 122% over the 10-year period.[7] The reason that the average deficit exceeds the average change in the debt ratio by 4.0% of GDP is that the growth dividend averages –4.0% of GDP. The –4.0% figure approximately equals

the average prior year's debt ratio of 109% times $-0.038/(1 + 0.038)$, where 3.8% is the average nominal GDP growth.

IV. Projected Excess Interest Implies That Ongoing Primary Deficits Entirely Drive the Rising Debt Ratio

Table 1 showed that CBO projects that net interest will be smaller than the (absolute value of the) growth dividend in every year in the 10-year outlook. On average in the period 2025–34, CBO projects that net interest will be 3.7% of GDP and that the growth dividend will be –4.0% of GDP. As a result, according to CBO projections, excess interest—net interest plus the growth dividend—will be negative throughout the decade. Hence, the effect of past debt on the debt ratio is negative throughout the decade. If primary deficits were zero, the debt ratio would fall throughout the decade despite the government spending 3.7% of GDP on interest payments. Instead, large ongoing primary deficits entirely drive the rising debt ratio.

Figure 2 plots table 1's values over time, highlighting that excess interest is projected to be slightly negative and thus primary deficits closely approximate CBO's projected debt ratio changes over the coming decade. Panel A combines the primary deficit and net interest into a single deficit series. As is visually apparent, the deficit far exceeds each year's debt ratio change. Panel B combines net interest and the growth dividend into a single excess interest series. As is visually apparent, the primary deficit closely approximates each year's debt ratio change, with excess interest being near zero and slightly negative throughout the decade.

Table 2 extends table 1's decomposition backward in time to 1980. The debt ratio change in column 3 equals the sum of columns 4–7. One sees that aside from recession years since 2000, net interest has remained consistently smaller than the (negative of the) growth dividend. Hence, excess interest has typically been negative this millennium. Notably, the growth dividend can be large both because of high real economic growth and because of high inflation. Those two forces combined to yield a growth dividend of –9.1% of GDP in 2022, its peak absolute value since 1980. However, CBO projects that inflation will return to normal, so stubbornly high inflation does not account for the large growth dividends and negative excess interest in CBO's outlook.

Table 3 reprints the net interest and growth dividend columns of table 2 and adds columns for excess interest, the excess interest rate, the nominal interest rate, and the nominal GDP growth rate. Excess interest and the excess interest rate were typically positive during the 1980s and 1990s.

Excess interest averaged –4.0% of GDP in the pre–Great Recession years 2003–7 and is projected to average –4.0% of GDP over the coming decade. That stability in excess interest is the net result of two offsetting effects: the debt-GDP ratio is projected to have tripled between 2003–7 and 2025–34, and the excess interest is projected to rise two-thirds of the way toward zero from –1.2% to –4.0%. The rise in the excess interest rate itself reflects a decline in the nominal GDP growth rate (from 5.7% in 2003–7 to 3.8% in 2025–34), only partially offset by a decline in the nominal interest rate (from 4.4% to 3.4%).

Finally, table 4 reprints Table S-1 from the President's Fiscal Year 2024 Budget (OMB 2023a), with a memorandum for excess interest. Beginning with the President's Budget for Fiscal Year 2022, Table S-1included a memorandum for real net interest, which I discuss in Section VII. Table 4 shows what Table S-1 would look like with a memorandum for excess interest. The excess interest memorandum shows that the net effect of past debt on the debt ratio is negative throughout the decade under the President's Budget, implying that rise in the debt ratio in the middle of the table is driven entirely by primary deficits.

V. Intuition for Why Excess Interest and Not Interest Equals the Effect of Past Debt on the Debt Ratio

Equation (3) showed mathematically why excess interest rather than interest equals the effect of past debt on the debt ratio. To solidify intuition, the following example considers two economies with primary deficits equal to zero, so the debt ratio can change only because of past debt. The two economies have very different levels of interest payments. However, they both have zero excess interest and therefore enjoy the same zero effect of past debt on the debt ratio: their debt ratios remain stable.

Suppose there is a Low Debt Economy with a 1% debt ratio at the end of last year: $1 of debt and $100 of GDP. Suppose there is a different High Debt Economy with a 1,000% debt ratio: $1,000 of debt and $100 of GDP. Suppose the interest rate and the GDP growth rate are 4% in both economies. Suppose both economies have zero primary deficit this year.

Interest payments in the two economies are very different. In Low Debt Economy, interest equals only $0.04, which is 0.038% of this year's $104 GDP. In High Debt Economy, interest equals a whopping $40, or 38% of this year's $104 GDP. As a result, debt rises in Low Debt Economy to $1.04 and in High Debt Economy to $1,040. The higher the debt ratio, the larger are interest payments as a percentage of GDP.

Yet the net result in both economies is that the debt ratio is stable. In Low Debt Economy, the new debt ratio equals $1.04 divided by $104 which equals 1%, exactly like last year. In High Debt Economy, the new debt ratio equals $1,040 divided by $104 which equals 1,000%, exactly like last year.

The reason that the debt ratio is stable in both economies despite the very different interest payments is that the two economies have very different growth dividends that exactly offset the interest payments. In Low Debt Economy, the growth dividend equals –0.038% of GDP: 1% times $-0.04/(1 + 0.04)$. Similarly, in High Debt Economy, the growth dividend equals –38% of GDP: 1,000% times $-0.04/(1 + 0.04)$. The higher the debt ratio, the larger is the growth dividend as a percentage of GDP, just like interest payments.

Excess interest and not interest correctly communicates that the debt ratio is stable. Interest payments are much higher in High Debt Economy than in Low Debt Economy, but excess interest equals zero in both economies, which is why neither economy experiences a change in its debt ratio. High Debt Economy adds much more to its debt than Low Debt Economy, but GDP growth in High Debt Economy reduces the debt ratio by many more percentage points than in Low Debt Economy because of its high debt ratio. Hence, only excess interest and not interest correctly indicates how past debt affects the debt ratio.

VI. America's Higher Debt Ratio Means Greater Vulnerability to Excess Interest Rate Risk

Despite CBO's forecast for negative excess interest over the next decade, America's higher debt ratio is not costless even if one were to assume that investment crowd-out impacts are zero. The reason is that the higher is the debt ratio, the more vulnerable America is to the risk that the excess interest rate $(r_t - g_t)/(1 + g_t)$ reaches any given positive value.

To see this, return to the previous section's comparison between Low Debt Economy and High Debt Economy. Suppose that the interest rate is still 4% but the GDP growth rate is only 3%, such that the excess interest rate equals $(0.04 - 0.03)/(1 + 0.03) = 1\%$. In this scenario, Low Debt Economy suffers only slightly: excess interest equals only 0.01% of GDP. For Low Debt Economy to keep its debt ratio stable, it would need to run a primary surplus of only 0.01% of GDP. In contrast, High Debt Economy suffers greatly: excess interest equals 10% of GDP. For High Debt Economy to keep its debt ratio stable, it would need to run a primary surplus of 10% of GDP.

Table 4
OMB Budget Totals, Amended to Show Excess Interest (in Billions of Dollars and as a Percentage of GDP)

													Totals	
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2024–28	2024–33
Budget totals in billions of dollars:														
Receipts	4,897	4,802	5,036	5,419	5,773	6,080	6,400	6,669	6,953	7,264	7,601	7,991	28,708	65,187
Outlays:	6,273	6,372	6,883	7,091	7,294	7,589	8,003	8,205	8,639	9,040	9,472	10,026	36,860	82,242
Deficit	1,376	1,569	1,846	1,671	1,521	1,509	1,604	1,536	1,686	1,776	1,871	2,035	8,151	17,054
Debt held by the public	24,252	25,910	27,783	29,592	31,233	32,851	34,517	36,106	37,838	39,650	41,553	43,619		
Debt held by the public net of financial assets	22,049	23,619	25,465	27,137	28,658	30,167	31,771	33,306	34,997	36,776	38,647	40,681		
GDP	25,000	26,336	27,238	28,432	29,679	30,909	32,188	33,534	34,968	36,489	38,076	39,732		
Budget totals as a percentage of GDP:														
Receipts (%)	19.6	18.2	18.5	19.1	19.5	19.7	19.9	19.9	19.9	19.9	20.0	20.1	19.3	19.6
Outlays (%):	25.1	24.2	25.3	24.9	24.6	24.6	24.9	24.5	24.7	24.8	24.9	25.2	24.8	24.8
Deficit (%)	5.5	6.0	6.8	5.9	5.1	4.9	5.0	4.6	4.8	4.9	4.9	5.1	5.5	5.2
Debt held by the public (%)	97.0	98.4	102.0	104.1	105.2	106.3	107.2	107.7	108.2	108.7	109.1	109.8		
Debt held by the public net of financial assets (%)	88.2	89.7	93.5	95.4	96.6	97.6	98.7	99.3	100.1	100.8	101.5	102.4		

Memorandum, real net interest:														
Real net interest in billions of dollars	–1,064	–513	177	242	249	254	271	298	337	375	417	447	1,192	3,066
Real net interest as a percentage of GDP (%)	–4.3	–1.9	.6	.9	.8	.8	.8	.9	1.0	1.0	1.1	1.1	.8	.9
Memorandum, excess interest:														
Excess interest in billions of dollars	–2,128	–635	–98	–386	–431	–384	–399	–421	–451	–475	–474	–486	–1,698	–4,005
Excess interest as a percentage of GDP (%)	–8.5	–2.4	–.4	–1.4	–1.5	–1.2	–1.2	–1.3	–1.3	–1.3	–1.2	–1.2	–1.1	–1.2

Note: This table reproduces Table S-1 from the President's Fiscal Year 2024 Budget, with added rows for excess interest. (I have removed footnotes and also a memorandum due to October 1 falling on a weekend.)

Figure 3 shows that according to CBO's latest long-term projections (CBO 2024a), the average effective interest rate on government debt will exceed the GDP growth rate beginning in 2040. The figure's interest rate series follows Auerbach and Gale (2023) in estimating the average nominal interest rate on government debt as equal to CBO's projection for current-year net interest, divided by the sum of the previous year's debt held by the public plus half of the current year's primary deficit. Adding half of the current year's primary deficit to the denominator is a simple way to account for interest paid on new debt from current-year primary imbalance. CBO directly reports the projected nominal GDP growth rate.

In CBO's projections, the reason that the interest rate rises above the growth rate in the long run is that primary deficits add to the debt ratio over time, which slowly feeds back into a higher interest rate relative to the growth rate (Gamber and Seliski 2019; Auerbach and Yagan 2024). The excess interest rate is projected to turn positive in 2040, at which point both the primary deficit and past debt are projected to increase the debt ratio. If economic forces happen to drive up interest rates relative to growth rates earlier than CBO expects, then the past debt would build on itself sooner than 2040.

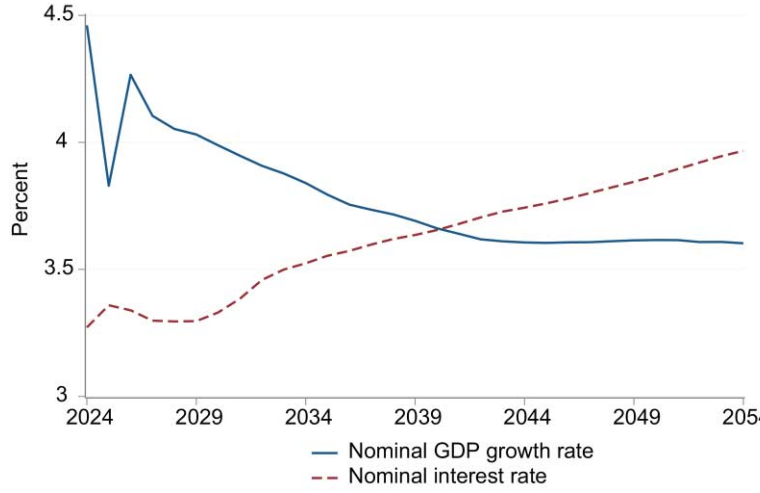

Fig. 3. CBO projects that excess interest will remain negative through 2040. This graph reproduces the third figure in Auerbach and Gale (2023) using the latest CBO long-term budget outlook (CBO 2024a) to plot the projected nominal GDP growth rate g_t and the average interest rate on government debt r_t over the next 30 years. The nominal growth rate equals year-on-year growth in nominal GDP minus one: $g_t = (\text{GDP}_t/\text{GDP}_{t-1}) - 1$. The average nominal interest rate on government debt equals CBO's forecast for current-year net interest, divided by the previous year's debt held by the public plus half of the current year's primary deficit, which is a simple way to account for interest paid on new debt from current-year primary imbalance.

VII. Relationship to Real Interest

Beginning in fiscal year 2022, the President's Budget added a line in its Table S-1 for real net interest as a share of GDP (see table 4). Real net interest equals net interest minus the component attributable to inflation π_t: $(r_t - \pi_t) \times (\text{DEBT}_{t-1}/\text{GDP}_t)$. Based on historical values for real interest as a share of GDP, Furman and Summers (2020) suggest that the United States should operate fiscal policy to keep expected real interest over the coming decade at or below 2% of GDP. The Furman-Summers fiscal rule effectively penalizes a country for the vulnerability of having a high debt ratio: the higher the debt ratio, the lower must be the real interest rate $r_t - \pi_t$ for real interest to remain below 2% of GDP. As a result, events like the Great Recession or the COVID-19 pandemic that suddenly raise the debt ratio have the potential to force a country obeying the Furman-Summers rule to reduce its primary deficits for the purpose of reducing its debt ratio and real interest rate.

Auerbach and Yagan (2024) adopt the Furman-Summers real interest trigger in their "sudden feedback" fiscal rule simulations. Despite its potential value as a fiscal rule trigger, real interest does not help to decompose debt ratio changes. Even if CBO tables reported real interest, they would still need to report a real growth dividend component equal to $(g_t - \pi_t) \times (\text{DEBT}_{t-1}/\text{GDP}_t)$ for readers to decompose each year's debt ratio change.

VIII. Conclusion

This article has shown how the addition of a growth dividend row to CBO's main budget table enables readers to exactly decompose each year's change in the debt-GDP ratio into the sum of the primary deficit, net interest, the growth dividend, and other (usually minor) means of financing as a share of GDP. Excess interest—the sum of net interest and the growth dividend—remains slightly negative in CBO's projection, which implies that primary deficits entirely drive America's unsustainable projected fiscal path. However, America's now-higher debt ratio implies greater vulnerability to the risk that the excess interest rate—the rate at which the debt ratio builds on itself—turns persistently positive.

Formula Appendix

Here are the detailed steps for going from equation (1) to equation (3), using the fact that $\text{GDP}_t = (1 + g_t) \times \text{GDP}_{t-1}$:

$$
\begin{aligned}
\mathrm{DEBT}_t - \mathrm{DEBT}_{t-1} &= \mathrm{NONINTERESTOUTLAYS}_t - \mathrm{REVENUES}_t + r_t \times \mathrm{DEBT}_{t-1} \\
\frac{\mathrm{DEBT}_t}{\mathrm{GDP}_t} - \frac{\mathrm{DEBT}_{t-1}}{\mathrm{GDP}_t} &= \frac{\mathrm{NONINTERESTOUTLAYS}_t}{\mathrm{GDP}_t} - \frac{\mathrm{REVENUES}_t}{\mathrm{GDP}_t} + \frac{r_t \times \mathrm{DEBT}_{t-1}}{\mathrm{GDP}_t} \\
\frac{\mathrm{DEBT}_t}{\mathrm{GDP}_t} - \frac{\mathrm{DEBT}_{t-1}}{\mathrm{GDP}_{t-1}} &= \frac{\mathrm{NONINTERESTOUTLAYS}_t}{\mathrm{GDP}_t} - \frac{\mathrm{REVENUES}_t}{\mathrm{GDP}_t} \\
&\quad + \frac{r_t \times \mathrm{DEBT}_{t-1}}{\mathrm{GDP}_t} + \frac{\mathrm{DEBT}_{t-1}}{\mathrm{GDP}_t} - \frac{\mathrm{DEBT}_{t-1}}{\mathrm{GDP}_{t-1}} \\
&= \frac{\mathrm{NONINTERESTOUTLAYS}_t}{\mathrm{GDP}_t} - \frac{\mathrm{REVENUES}_t}{\mathrm{GDP}_t} \\
&\quad + \frac{r_t \times \mathrm{DEBT}_{t-1}}{\mathrm{GDP}_t} + \frac{\mathrm{DEBT}_{t-1}}{(1+g_t) \times \mathrm{GDP}_{t-1}} - \frac{1+g_t}{1+g_t} \times \frac{\mathrm{DEBT}_{t-1}}{\mathrm{GDP}_{t-1}} \\
&= \frac{\mathrm{NONINTERESTOUTLAYS}_t}{\mathrm{GDP}_t} - \frac{\mathrm{REVENUES}_t}{\mathrm{GDP}_t} \\
&\quad + \frac{r_t \times \mathrm{DEBT}_{t-1}}{\mathrm{GDP}_t} + \frac{-g_t}{1+g_t} \times \frac{\mathrm{DEBT}_{t-1}}{\mathrm{GDP}_{t-1}}.
\end{aligned}
$$

Finally, and as noted in Section II, two usually minor terms must be included to make the formula exact. First, there is an extra "other means of financing" term for other transactions affecting borrowing from the public. In addition, the government must pay "other interest" on incremental debt issued to fund the current-year primary deficit. For example, the government pays some interest in February on new debt issued in January to support a primary deficit in January. As a result, the exactly true formulas—which I implement in the exact decompositions of tables 1 and 2 and figure 2—include additional terms:

$$
\begin{aligned}
\underbrace{\mathrm{DEBT}_t - \mathrm{DEBT}_{t-1}}_{\text{Deficit}} &= \underbrace{\mathrm{NONINTERESTOUTLAYS}_t - \mathrm{REVENUES}_t}_{\text{Primary deficit}} \\
&\quad + \underbrace{r_t \times \mathrm{DEBT}_{t-1} + \mathrm{OTHERINT}_t}_{\text{Net interest}} + \mathrm{OTHERMEANS}_t \\
\underbrace{\frac{\mathrm{DEBT}_t}{\mathrm{GDP}_t} - \frac{\mathrm{DEBT}_{t-1}}{\mathrm{GDP}_{t-1}}}_{\text{Debt ratio change}} &= \underbrace{\frac{\mathrm{NONINTERESTOUTLAYS}_t}{\mathrm{GDP}_t} - \frac{\mathrm{REVENUES}_t}{\mathrm{GDP}_t}}_{\text{Primary deficit}} \\
&\quad + \underbrace{\underbrace{\frac{r_t \times \mathrm{DEBT}_{t-1} + \mathrm{OTHERINT}_t}{\mathrm{GDP}_t}}_{\text{Net interest}} + \underbrace{\frac{-g_t}{1+g_t} \times \frac{\mathrm{DEBT}_{t-1}}{\mathrm{GDP}_{t-1}}}_{\text{Growth dividend}}}_{\text{Excess interest}} \\
&\quad + \frac{\mathrm{OTHERMEANS}_t}{\mathrm{GDP}_t},
\end{aligned}
\tag{A1}
$$

where r_t is defined as the average nominal interest on debt outstanding as of the start of the current year, without regard to the interest rate on incremental debt issued to fund the current-year primary deficit. The primary deficit, net interest, and other means of financing in tables 1 and 2 and figure 2 come directly from CBO, and I compute the growth dividend using CBO values of g_t and $\text{DEBT}_{t-1}/\text{GDP}_{t-1}$.

Endnotes

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1. In the actual pre–Great Recession years, the growth dividend averaged 2% of GDP via a debt ratio below 50% and a nominal GDP growth rate above 4%.

2. Importantly, by phrases like "the amount by which past debt grows on itself" and "the impact of past debt on the debt ratio," I mean the mechanical accounting effect of debt on the debt ratio over and above any effect on the primary deficit. I therefore exclude any behavioral effects of debt on the primary deficit, such as investment crowd-out or political feedback (Hicks 1937; Bohn 1998). Haque and Montiel (1994) use "excess interest" in a different context, comparing debt yields to capital returns.

3. Bohn (2008) uses i and y to denote the nominal interest rate and GDP growth rate, whereas Mian, Straub, and Sufi (2024) use R and G. I use lowercase r and g as in Ball et al. (1998) and Auerbach and Yagan (2024), which clearly distinguish lowercase rates from uppercase dollar amounts without resorting to less familiar y notation.

4. The President's Budget refers to other means of financing as "other transactions affecting borrowing from the public."

5. The category "other means of financing" was large in 2023 because the Treasury reversed extraordinary measures it undertook in 2021 to avoid a debt ceiling breach. Specifically, the Treasury in 2021 spent down its cash reserves and suspended investments in the Thrift Savings Plan (TSP) Government Securities Investment Fund (G-Fund) for government workers' tax-preferred retirement savings accounts. In 2022 and 2023, the Treasury replenished cash reserves and fully reinvested the TSP G-Fund, which required a one-time increase in debt issuance. See OMB (2023b).

6. The 2024 nominal growth rate y_{2024} of 5.5% equals the 2024 value of GDP divided by the 2023 value, minus one.

7. These values in the June 2024 CBO outlook differ slightly from those in the February 2024 outlook cited by the *Wall Street Journal* in the introduction.

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