Fiscal Consequences of the US War on COVID∗

George J. Hall† Thomas J. Sargent‡

May 28, 2023

Abstract

We compare prospective paths of US federal taxes, government expenditures, interest payments, and debt in the post-COVID period to actual paths after earlier US wars. Interest rate rises and inflation have already imposed losses on federal creditors and prompted the Fed to extend its quantitative easing project to transfer interest rate risk from private banks to itself. We discuss alternative budget-feasible paths for market values of US Treasury debt associated with authoritative projections of taxes and expenditures. Government expenditure/GDP surges in past US Wars had permanent components that were accompanied by permanent rises in tax collections/GDP ratios. Part of the War on COVID expenditure/GDP surge has endured, but so far tax collections haven’t risen relative to GDP. The evolution of those two ratios will have consequences for the debt/GDP ratio.

∗This paper was prepared for the 2023 Bank of Korea International Conference. We thank Shane Shifflett and Manjola Tase for helping us locate and understand various banking time series. We thank William Berkley for supporting our research. Hall thanks the Theodore and Jane Norman Fund for financial support.

†Brandeis University, E-mail: ghall@brandeis.edu.

‡New York University, E-mail: thomas.sargent@nyu.edu.
1 Who Pays and How

In our 2022 pattern recognition exercise comparing US government finances during the “War on COVID” with World Wars I and II, we observed that, as percentages of total revenues, sources of federal revenue were:

<table>
<thead>
<tr>
<th></th>
<th>taxes</th>
<th>bonds</th>
<th>money</th>
</tr>
</thead>
<tbody>
<tr>
<td>World War I</td>
<td>20.8</td>
<td>74.6</td>
<td>7.0</td>
</tr>
<tr>
<td>World War II</td>
<td>30.2</td>
<td>46.0</td>
<td>10.1</td>
</tr>
<tr>
<td>COVID-19</td>
<td>4.0</td>
<td>38.1</td>
<td>45.1</td>
</tr>
</tbody>
</table>

During each episode, the federal government financed mostly issued interest-bearing debt and non-interest-bearing money rather than collect taxes. During World Wars I and II, the federal government mostly issued interest-bearing debt instead of money. In contrast, during the War on COVID-19, it mostly issued money. And compared with World Wars I and II, the US raised an even smaller percentage of GDP by war-time taxes.

If explicit taxes are not levied during a war, someone is still bound to pay later, either through higher taxes, reduced expenditures, or “rescheduling” promised debt servicing (a euphemism for “defaulting”). Who is likely to pay for the US War on COVID? Our guess is federal creditors.\(^1\)

- Losses to creditors coming from inflation and rising interest rates are borne holders of Treasury securities, not by short-term lenders to the Fed.

- Bondholders have already suffered capital losses.
  - Holders of long-duration government bonds have faced the largest losses.
  - Banks and other depository institutions that engage in maturity transformation have absorbed significant losses.

- The Fed’s COVID Quantitative Easing Program, inaugurated in March 2020, has transferred much interest rate risk to itself. Its borrowing costs now exceed the income that it earns from its portfolio of Treasury and mortgage backed securities, so each month the Federal Reserve incurs more losses. It has over $1 trillion in unrealized losses on its asset portfolio.

- Government spending as a share of GDP has risen permanently after past expenditure surges. Projections by the Congressional Budget Office and budget proposals from the Biden Administration and House Republicans convince us that government spending will permanently rise above its pre-COVID share of GDP. But in a departure from precedent, the federal government seems unlikely to run primary surpluses for the foreseeable future.

\(^1\)We say federal creditors rather than Treasury creditors because, in addition to the Treasury selling securities to the public, the Federal Reserve borrows on behalf of the federal government from banks in the form of interest-bearing reserves and money markets in the form of reverse repurchase agreements.
This figure displays $100 \times (\log P_t - \log P_{\text{start of war}})$, where $P_t$ is the CPI for All Urban Consumers, NSA. Ticks on the $x$-axis correspond to January for the 1914 to 1926 period and March for the 1939 to 1951 period. For the COVID-19 war, the series begins January 2020 and ends April 2023.

- Unless Congress takes action soon, the US Treasury will hit its statutory debt limit. But the peculiar way that Congress has stated it opens up perfectly legal ways for the Treasury and the Fed to meet the debt limit.

To set the stage, we reproduce two figures from Hall and Sargent (2022) that compare the time paths of the consumer price index (CPI) and the cumulative returns earned by a representative creditor to the US Treasury.

In figure 1, we compare the natural log of the US price level for the 12 years after the start of World War I with a period of the same length after the start of World War II. For each war, we normalize the price level by the transformation $100 \times (\log P_t - \log P_{\text{start of war}})$, so a series records cumulative percentage changes in the price level after the war’s start. The blue line reports the log of the price level for the 39 months following COVID-19. The vertical black line at December 2021 demarcates the end of the War on COVID-19.

This figure confirms how the price level rose during both world wars. After World War I, the price level peaked in 1919 at more than 70% higher than its pre-war level. The price level subsided during the deep but short 1920-1921 depression but remained about 55% higher than its 1914 level ten years after the war.

After World War II, price and wage controls postponed price level increases. A surge in the price level accompanied the lifting of price controls in 1946. For both twentieth-century world wars, the price level stood at roughly 55% higher between 7 to 12 years after the war. This
Figure 2: Real Value of $100 Portfolio of Treasury Securities Invested at Starts of Wars

This figure reports the cumulative real values coming from continually reinvesting in a value-weighted re-balanced portfolio of all outstanding US Treasury securities of an initial investment of $100 at the start of each war. Ticks on the x-axis correspond to January for the 1914 to 1926 period and March for the 1939 to 1951 period. For the COVID-19 war, the series begins January 2020 and ends December 2022.

enduring increase in the price level contributed to low real returns, as we now show in figure 2.

Each line in figure 2 reports cumulative real values coming from continually reinvesting in a value-weighted re-balanced portfolio of all outstanding US Treasury securities, starting with an initial investment of $100.² Although real values of the Treasury’s portfolio initially rose during both twentieth-century world wars, as the price level rose, real returns fell. For the post-World War I period, rising interest rates drove bond prices down so that by June 30, 1920, long-term bonds traded 10 to 15% below their par value. Combined with a higher price level, these low bond prices contributed to cumulative real losses of nearly 50% to federal bondholders. A reduction in the price level and decreased interest rates in the early 1920s helped boost the value of the Treasury’s portfolio; but even by 1926, the value of the Treasury’s portfolio had still not returned to its pre-war value in real terms.

Mindful of the post-World War I experience, Treasury officials reduced interest rate risk by fixing bond yields during World War II. That kept nominal returns on the Treasury’s portfolio low and stable during the 1940s, but movements in real returns mirrored movements in the price level. As a result, by 1951, the Treasury’s portfolio was worth only 70 percent of its pre-war value.

²The real value at time $t$ is $100 \times \prod_{s=\text{start of war}}^{t} \left(1 + r_{s,s+1}\right)^{1 + \pi_{s,s+1}}$, where $r_{s,s+1}$ is the nominal net return on the portfolio between month $s$ and $s + 1$ and $\pi_{s,s+1}$ is the inflation rate between month $s$ and $s + 1$. Thus, the units are start-of-war dollars.
The blue lines in figures 1 and 2 report the price level and cumulative returns for the COVID-19 period. During the first two years of the War on COVID-19, the price level increases tracked those of the two prior world wars; however since June 2022, growth in prices has slowed. Cumulative real returns on the Treasury securities during the first three years since the outbreak of COVID tracked closely the sharp losses incurred during World War I.

2 Government Budget Arithmetic

We start with the federal government’s nominal budget constraint at time $t$:

$$G_t + r^B_{t-1,t} B_{t-1} + (A_t - A_{t-1}) = T_t + (B_t - B_{t-1}) + r^A_{t-1,t} A_{t-1} + (M_t - M_{t-1}) + OM_t$$  \hspace{1cm} (1)

where

- $G_t$ = Government outlays, net of official interest payments
- $B_{t-1}$ = Nominal market value of interest-bearing government debt held by private investors at the end of $t - 1$
- $r^B_{t-1,t}$ = Nominal value-weighted return on government debt between $t - 1$ and $t$
- $A_t$ = Private assets purchased by the Federal Reserve
- $r^A_{t-1,t}$ = Nominal return on Fed-held private assets between $t - 1$ and $t$
- $T_t$ = Tax receipts
- $M_t$ = Federal Reserve credit
- $OM_t$ = Funding by Other Means

Funding by Other Means includes IMF dollar deposits and also letters of credit to the IMF, changes in special drawing rights certificates issued to Federal Reserve Banks, and net activities of various federal loan programs.

To measure real returns realized by bondholders, we make three adjustments to the US Treasury’s accounts of debt outstanding and interest payments. To include only government debt held by private investors, both domestic and foreign, we net out holdings by the Federal Reserve and Government Agencies and Trust Funds. In figure 3, we decompose the par value of the total public debt outstanding as a share of GDP from 1900 to 2022 into these four ownership classes. Section 4.1 tells classes of creditors that own US Treasury debt. Second, we use promised payment streams and bond price data from Hall et al. (2022) to construct a market value measure of Treasury debt. The market value takes into account differences between interest rates and coupon rates at the time the debt is issued as well as changes in interest rates and repayment probabil-
Figure 3: Par Value of US Treasury Debt by Ownership as Percents of GDP: 1900 to 2022

... after bonds were issued; it answers the question: how much would the government pay if it were to repurchase the entire portfolio of privately-held debt at current market prices? Third, we measure interest payments on the debt, \( r_{t-1,t} \), by the value-weighted return on the portfolio of US Treasury debt. This measure differs from the US Treasury’s series of Interest Expense on the Debt Outstanding, an accounting measure that reports the sum of coupon payments on Treasury notes and bonds and the accrued interest on zero-coupon Treasury bills.\(^3\)

We make a further adjustment to account for the Federal Reserve’s purchase of Treasury securities and private assets and its expansion of liabilities to pay for these purchases. Panel 4a shows how Federal Reserve holdings of Treasuries and private assets (largely mortgage backed securities, denoted MBS) surged in the second quarter of 2020 when the Treasury issued $2.8 trillion in new debt and private investors sought liquidity. The Fed increased its holdings of Treasuries and MBSs by $1.8 trillion. The Fed continued purchasing assets until mid-2022.

Fed liabilities increased in tandem. Panel 4b indicates that bank reserves (tan) and Treasury deposits (blue) jumped. For about a year after March 2020, bank reserves grew fast as the Treasury gradually drew down and spent its deposits at the Fed. But in March 2021, growth in bank reserves slowed markedly while reverse repurchase agreements (reverse repos) (red) directed toward money market funds accelerated rapidly. Reverse repos function as reserve accounts at the Fed and reflect that now the Fed borrows from money market funds as well as from banks. The Fed pays interest on reverse repos, though at lower rates than on bank reserves.

In October 2008, the Federal Reserve began paying interest on reserve deposits, effectively...
making them perfect substitutes for interest-bearing Treasury debt. To recognize that change in Fed operating procedures, the green line in figure 5 graphs the sum of the market value of the privately held Treasury debt and interest-bearing reserve deposits and reverse repos at the Federal Reserve, i.e., a sum of the tan and red areas in panel 4b. Counting reserves at the Fed and the Fed’s reverse repo positions as interest-bearing debt increases the ratio of privately-held federal debt to GDP from 67.1% to 88.6% as of December 31, 2022.4

The green line overstates federal interest-bearing debt held by private investors because the Fed used some of the revenues generated by issuing those reserve deposits to purchase private assets. To adjust for that, the light blue line in figure 5 plots the market value of the privately-held Treasury debt plus reserve deposits and reserve repos at the Federal Reserve minus Federal Reserve holdings of privately issued securities (i.e., the brown area in panel 4a). The gap between green and light blue lines measures reserve deposits that are “backed” by private securities, a component of Fed open market operations that brings to mind a “real bills” doctrine written into the original 1913 legislation that created the Fed.5

The Fed serves as the US Treasury’s fiscal agent, so its interest-bearing reserve deposits and reverse repos are ultimately backed by the full faith and credit of the US federal government. For that reason, we include them (net of private asset purchases) in one of our measures of the interest-bearing federal debt; however, as we discuss in section 6, unlike securities issued by the Treasury, these liabilities of the Federal Reserve do not count against the statutory debt limit.

---

4. We record interest-bearing reserve deposits and reverse repos at the Federal Reserve at their face or par values.
5. Sargent and Wallace (1982) present an historical account of and peculiar perspective on the real bills doctrine.
From December 2019 to December 2022, the par value of privately-held Treasury debt increased by $4.2 trillion from $14.9 to $19.1 trillion. If we add the Federal Reserve’s interest-bearing reserve deposits and reverse repos and net out cash balances held by the Treasury, we learn that federal debts rose from $16.4 to $24.3 trillion.\footnote{Further, as we will discuss in section 6, during these three years, total debt subject to the statutory debt limit rose from $23.2 to $31.4 trillion.}

While the level of debt increased nearly monotonically, the path of the debt/GDP ratio did not. Look at figure 5. The red line plots the ratio of the par value of privately-held Treasury debt to GDP.\footnote{All series in this figure net out Treasury cash balances.} This ratio rose from 66.6% in December 2019 to 74.5% in June 2020, then it fell to 69.4% in September 2020; during the next 27 months it stayed within a band between 69.2% and 71.5%.

In December 2019 the market value of the debt (the dark blue line) exceeded its par value. The ratio of the market value of debt to GDP rose from 68.3% in December 2019 to 77.1% in June 2020; but it declined throughout 2021 and 2022. By December 2022, it was only 67.1%. Measured at its market value, the debt/GDP ratio was lower at the end of 2022 than it had been before the outbreak of COVID-19.

Counting the Fed’s interest-bearing reserve deposits and reverse repos as debt (see the green
We date the end of the War on COVID as December 31, 2021. We decompose the postwar decrease in the debt/GDP ratio that occurred in 2022 into contributions made by nominal returns paid on Treasury securities net returns paid on private assets, GDP growth, inflation, the primary deficit, and seignorage. We divide each term in equation (1) by nominal GDP, which we denote $Y_t$. After rearranging terms, we get:

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = \left( \frac{r_{t-1,t}^B}{Y_{t-1}} B_{t-1} - \frac{A_{t-1}}{Y_{t-1}} \right) - \frac{g_{t-1,t}}{Y_{t-1}} \frac{B_{t-1} - A_{t-1}}{Y_{t-1}} - \frac{\pi_{t-1,t}}{Y_{t-1}} \frac{B_{t-1} - A_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t} - \frac{M_t - M_{t-1}}{Y_t} - \frac{OM_t}{Y_t} + \left( \frac{A_t}{Y_t} - \frac{A_{t-1}}{Y_{t-1}} \right)$$

where $g_{t-1,t}$ denotes the net growth rate of real GDP, and $\pi_{t-1,t}$ denotes the net inflation rate.

The left side of equation (2) records the change in the debt/GDP ratio. The first term on the right side is interest payments on government debt net interest received on the Federal Reserve’s holdings of private assets as a share of GDP. The next two terms record decreases in the net debt/GDP ratio contributed by real GDP growth and inflation. The following four terms are the primary deficit, Federal Reserve credit, other means, and purchases of private assets by the Federal Reserve as shares of GDP. The final term is a cross-product of two growth rates.

Columns (1) - (3) of table 1 summarize changes in the debt/GDP ratio during 2022. Columns (4) - (9) report our decomposition into components attributable to (i) net nominal interest payments, (ii) GDP growth, (iii) inflation, (iv) the primary deficit, (v) money growth, and (vi) the sum of asset purchases, other means, the cross term, and a residual.

The first row of table 1 is the market value of privately-held Treasury debt net Treasury cash balances (figure 5, dark blue line); the Fed’s holdings of reserves and reverse repos are counted as

<table>
<thead>
<tr>
<th></th>
<th>100 x Debt/GDP</th>
<th>Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>2021:12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2022:12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>change</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Decomposition of Post-War Changes in Debt/GDP Ratio

Other includes asset purchases, other means, the cross term, and the error term.
money. This makes the debt/GDP ratio fall from 71.1% to 67.1%. In the second row, we count these Fed liabilities as interest-bearing federal debt (figure 5, green line). Under this accounting convention, the debt/GDP ratio fell from 95.4% to 88.6% in 2022. This 2022 reduction was driven by

1. Capital losses that resulted in negative returns on Treasury debt. As we document below, the 2022 real return on the portfolio of US Treasury securities was -9.4%. These negative returns were partly offset by the Fed’s having increased the interest it pays to banks on reserves from 0.15% in December 2021 to 4.40% in December 2022 together with increases in the Fed’s holdings of reverse repos. Overall, net returns account for 41% of the reduction.

2. Real GDP growth. Real GDP grew 0.9%, accounting for 10% of the reduction.

3. Inflation. The GDP deflator increased by 6.4%, accounting for 75% of the reduction.

Offsetting these three contributions, the federal government ran a primary deficit and the Federal Reserve decreased Fed credit (i.e., the money supply), so the three factors sum to more than 100%. Had the federal government run a balanced primary budget, the debt/GDP ratio at the end of 2022 would have been 85.1% instead of 88.6%.

Two important drivers of the 2022 reduction in the debt/GDP ratio were rising inflation and negative returns. In the next section, we examine their impact on federal bondholders in more detail.

4 Fiscal Consequences of Inflation

We use two measures of inflation. In our table 1 decomposition of the debt/GDP ratio, we measure inflation using the GDP deflator. In figures 1 and 2, we report inflation in the nonseasonally adjusted CPI for all urban consumers. Both measures started registering big price level increases in the second half of 2020. That had two adverse consequences for federal creditors.

1. Directly, it imposed real losses on bondholders and other owners of promises to future government payment streams.\(^8\)

2. Indirectly, it caused the Federal Reserve to raise interest rates, triggering falls in prices of Treasury and other fixed-income securities.

In this section, we describe losses incurred by three classes of creditors: foreigners, US banks and other depository institutions, and the Federal Reserve. We also measure the sensitivity of the market value of Treasury debt to changes in interest rates.

\(^8\)One important exception is Social Security payments which are indexed to inflation.
4.1 Who Lends to the US Treasury?

Figure 3 decomposed the par value of the total US Treasury debt outstanding as a share of GDP from 1900 to 2022 into four ownership classes: the Federal Reserve, Government Agencies and Trust Funds, foreign investors, and domestic private investors. Before World War I, domestic private investors nearly all US Treasury debt, mostly by national banks. As federal borrowing requirements grew over time, US Treasury debt broadened and deepened. Treasuries are now widely held both at home and abroad.

As we report in table 2, by the end of 2022, of the over $31 trillion in total debt outstanding (measured at its par value), 17.2% was held by the Federal Reserve, 21.9% was in government accounts and trust funds, 23.4% was held by foreign investors, and 37.5% was held by domestic private investors. For these last three ownership classes, we describe some important holders.

- Of the $6.9 trillion in Treasury debt held by government agencies and trust funds, over 75% is held by three trust funds: the Social Security Old Age, Survivors and Disability (OASDI) Trust Fund, the Department of Defense Military Retirement Fund, and Office of Personnel and Management Civil Retirement Funds. These funds hold mostly nonmarketable debt.
- Of the $7.3 trillion in Treasury debt held by foreigners, 1/3 is held inside Japan, Mainland China, and the United Kingdom. Korea is the 17th largest foreign holder of US Treasuries.
- Within the class of domestic private investors, US banks and other depository institutions hold $1.7 trillion of US Treasuries, about 5% of the total outstanding debt.

4.2 Losses on US Treasury Securities

In response to the COVID inflation that began in the second half of 2020, starting on March 17, 2022, the Federal Reserve initiated a sequence of increases in the Federal Funds Rate, ten so far, that have raised the target rate from 0-0.25% to 5.00-5.25% now in early May 2023.

Figure 6 plots the Effective Fed Funds Rate, the Award Rate on Reverse Repurchase Agreements, and the yield on Treasuries at a 10-year constant maturity from January 2000 to April 2023. Evidently, the Federal Reserve twice set the Fed Funds Rate to near zero, once in December 2008 in response to the financial crisis, and again in March 2020 in response to the COVID-induced business shutdowns. During the last three quarters of 2020 and throughout 2021, the effective Fed Funds rate stayed between 0.06% and 0.10% in 2021. It rose from 0.8% in December 2021 to 4.41% in December 2022. On April 21, 2023, it was 4.83%. The award rate on reverse repurchase agreements moved in tandem with the Fed Funds rate.

Along with the increases in inflation and the Fed Funds rate, long-term rates rose in 2021 and 2022. The yield on Treasuries at a 10-year constant maturity rose from a low of 0.55% in
<table>
<thead>
<tr>
<th>Creditor</th>
<th>Par Value (in billions)</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Reserve</td>
<td>$5,398.1</td>
<td>17.2%</td>
</tr>
<tr>
<td>Gov’t Agencies and Trust Funds</td>
<td>6,867.5</td>
<td>21.9%</td>
</tr>
<tr>
<td>OASDI Trust Fund</td>
<td>2,830</td>
<td></td>
</tr>
<tr>
<td>DoD Military Retire Fund</td>
<td>1,355</td>
<td></td>
</tr>
<tr>
<td>OPM Civil Service Retire Fund</td>
<td>1,007</td>
<td></td>
</tr>
<tr>
<td>Foreign Investors</td>
<td>7,318.7</td>
<td>23.4%</td>
</tr>
<tr>
<td>Japan</td>
<td>1,076.3</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>867.1</td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>654.5</td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td>102.9</td>
<td></td>
</tr>
<tr>
<td>Domestic Private Investors</td>
<td>11,763.0</td>
<td>37.5%</td>
</tr>
<tr>
<td>Depository Institutions</td>
<td>1,715.8†</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$31,347.3</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Table 2: Treasury Debt Ownership: December 2022

† Flow Funds, Table L.210 (sum of lines 25-28, 53)

---

Figure 6: Effective Federal Funds Rate, Reverse Repurchase Award Rate, and Yield on US Treasury Securities at the 10-Year Constant Maturity
July 2020 to 3.57% in April 2023. This increase in interest rates throughout the term structure resulted in capital losses on a wide range of bondholders.

We compute ex-post returns for marketable Treasury securities for 2021 and 2022 for which we have prices from the CRSP database. Annual nominal returns categorized by Treasury security type were:

<table>
<thead>
<tr>
<th></th>
<th>2021</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bills</td>
<td>0.05%</td>
<td>1.30%</td>
</tr>
<tr>
<td>Notes</td>
<td>-1.38</td>
<td>-6.47</td>
</tr>
<tr>
<td>Bonds</td>
<td>-4.26</td>
<td>-27.50</td>
</tr>
<tr>
<td>TIPS</td>
<td>5.79</td>
<td>-16.67</td>
</tr>
</tbody>
</table>

A bond price is more to changes in interest rates, the longer is its duration. Consequently holders of long-term Treasury bonds incurred much larger losses than holders of short-term Treasury bills. With continuous reinvesting of proceeds and starting with an initial investment of $100 on January 1, 2020, figure 7 plots cumulative nominal returns on Treasury securities by security type. Since the Fed began raising the Fed Funds rate, long-term Treasury bondholders have lost 25% of their initial investment. A US government creditor who held a representative value-weighted

---

9These returns are consistent with Vanguard ETF and mutual fund returns. Consider the annual returns of the following four funds for 2021 and 2022:

---
portfolio of the US Treasury securities earned a -1.0% and -9.4% return on their holdings during 2021 and 2022, respectively. Figure 2 indicates that these COVID-era losses are comparable to the losses Treasury creditors incurred after World Wars I and II.

To portray differences between our mark-to-market accounting and the Treasury’s accounting, note that in 2022 the US Treasury reported spending $774,679 million in gross interest payments on Treasury Debt Securities. Dividing this number by the gross par value of US Treasury debt at the end of June 2022 to compute a “rate of return” yields:

\[
100 \times \frac{774,679}{30,568,581} = 2.53\%.
\]

Official accounting measures of debt and interest payments neglect capital gains and losses, a consequential omission today.

### 4.2.1 Losses by Foreigners

Capital losses imposed on foreigners helped improve the US net international investment position (NIIP). Panel 8a shows that, despite running a current account deficit of 3.7% of GDP during 2022, as percents of GDP, the US NIIP rose from -77.7 at the end of 2021 to -63.3 at the end of 2022. Panel 8b shows that this improvement came from a fall in the value of US liabilities that was larger than a fall in the value of US assets.

Table 3 provides details by reporting components of the change in US liabilities. In 2022 US liabilities excluding financial derivatives fell $5,898.8 billion. Because the value of foreign-owned US assets fell by $7,622.3 billion, this drop occurred despite foreigners having purchased $1,515 billion of US assets. The drop in values of long-term debt securities accounted for $1,838.5 or 24% of the total change. Foreigners sold $37.4 billion in US Treasury bills and purchased $413.4 billion in US Treasury bonds and notes despite having incurred $844 billion in losses on these long-term securities. Those capital losses represent 11.5% of the $7,318.7 billion in par value of Treasury securities held by foreigners in December 2022.

### 4.2.2 Depository Institutions Losses

Table 2 indicates that in December 2022 commercial banks and other depository institutions held $1.7 trillion in Treasury securities (about 5% of the gross outstanding stock). Figure 9 plots total bank assets (left axis) and bank holdings of Treasuries, mortgage-backed securities, and state

<table>
<thead>
<tr>
<th>Security Type</th>
<th>2021</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra-Short Term Treasury (VUSB)</td>
<td>-0.43%</td>
<td>0.12%</td>
</tr>
<tr>
<td>Mid-Term Treasury (VGIT)</td>
<td>-2.57</td>
<td>-10.67</td>
</tr>
<tr>
<td>Long-Term Treasury (VGLT)</td>
<td>-5.03</td>
<td>-29.44</td>
</tr>
<tr>
<td>Inflation Protected Securities (VIPSX)</td>
<td>5.56</td>
<td>-11.95</td>
</tr>
</tbody>
</table>
Figure 8: US Net International Investment Position and Assets and Liabilities, Percent of GDP

Source: BEA, US International Investment Position, 4th Quarter and Year 2022; Annual data

Table 3: Change in US Liabilities and Select Components for 2022 (in billions of dollars)

<table>
<thead>
<tr>
<th>Attributable to</th>
<th>Total Change for 2022</th>
<th>Financial Transactions</th>
<th>Price Changes</th>
<th>Ex-rate Changes</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Liabilities</td>
<td>-$5898.8</td>
<td>$1,515.8</td>
<td>-$7,622.3</td>
<td>-$105.9</td>
<td>$313.6</td>
</tr>
<tr>
<td>Short-term debt securities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treasury bills and certificates</td>
<td>-37.4</td>
<td>-37.4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other short-term securities</td>
<td>94.6</td>
<td>96.5</td>
<td>0</td>
<td>-1</td>
<td>-0.9</td>
</tr>
<tr>
<td>Long-term debt securities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treasury bonds and notes</td>
<td>-395.7</td>
<td>413.4</td>
<td>-844.0</td>
<td>0</td>
<td>34.9</td>
</tr>
<tr>
<td>Other long-term securities</td>
<td>-577.2</td>
<td>445.8</td>
<td>-994.5</td>
<td>-55.3</td>
<td>26.8</td>
</tr>
</tbody>
</table>

Source: BEA, US International Investment Position, 4th Quarter and Year 2022, Table 2
Figure 9: Total Bank Assets (left axis) and Bank Holdings of Treasuries, Mortgage Backed Securities, and State and Municipal Bonds as Percents of Total Assets (right axis)


Figure 10: Unrealized Gains and Losses at Commercial Banks and Other Depository Institutions

Source: FFIEC, Call Reports, Schedule RC-B.
and municipal bonds as shares of total bank assets (right axis). In mid-2020, the US Treasury began distributing payments to many individuals and businesses as instructed by the CARES Act. That coincided with a noticeable 2020 surge in total assets at commercial banks and saving institutions as many individuals and businesses deposited their CARES Act benefits into bank accounts. Banks increased their holdings of Treasuries and mortgage-backed securities as shares of their total assets.

Those mortgage-backed and Treasury securities lost value in 2022. In figure 10, we plot unrealized gains and losses recorded by bank call reports. For the fourth quarter of 2022, unrealized losses on bank balance sheets totaled $475 billion. Of these losses:

- $90 billion were on US Treasuries,
- $340 billion were on residential and commercial mortgage back securities, and
- $45 billion were on government agency debt, asset-backed securities, and state and municipal securities.

Jiang et al. (2023a) detected only limited banks’ purchases of hedges that would have offset these losses. Jiang et al. (2023b) find that the market value of the US banking system is $2 trillion lower than recorded by book values and that almost 190 US banks would become insolvent if half of their uninsured depositors were to withdraw their deposits. This situation sets the stage for our next subsection.
4.3 Losses to the Federal Reserve

Table 2 indicated that the Federal Reserve held $5.4 trillion in Treasury securities as well as its $2.6 trillion of mortgage-backed securities. Figure 11 plots the maturity structure of the Federal Reserve’s holdings of Treasury securities and thereby elaborates information presented earlier in the green-shaded area in panel 4a. Evidently, the Federal Reserve’s portfolio of Treasury securities has tilted toward longer-term issues, notes, and bonds. Treasury bills comprise a relatively small share.

The Federal Reserve’s holdings of Treasury securities in December 2021 and 2022 (in billions of dollars) were

<table>
<thead>
<tr>
<th></th>
<th>2021</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bills</td>
<td>$326.0</td>
<td>$291.2</td>
</tr>
<tr>
<td>Notes and Bonds</td>
<td>4,846.5</td>
<td>4,702.4</td>
</tr>
<tr>
<td>TIPS</td>
<td>383.2</td>
<td>377.4</td>
</tr>
<tr>
<td>Floating-Rate Notes</td>
<td>24.3</td>
<td>27.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$5,580.1</td>
<td>$5,398.1</td>
</tr>
</tbody>
</table>

Goodfriend (2014) asserted that the Federal Reserve effectively runs a “bond market carry trade” strategy by investing the proceeds of overnight borrowing to finance purchases of long-duration Treasury securities. But unlike some cautious private hedge funds, the Fed has not hedged any of the interest rate or duration risk. So long as the interest rate on overnight loans remains below the coupon rates on its long-term bonds, this approach makes money. But figure 6 shows that by raising the overnight interest rate over this past year, the Fed has raised its own cost of funds. Starting in early September 2022, the Goodfriend’s “Fed hedge fund” began operating at a loss as its borrowing costs have exceeded earnings from its portfolio of Treasury and mortgage-backed securities.10 The Fed’s earning remittances to the Treasury have turned negative.11

The liability side of the Fed balance sheet records earning remittances due to the US Treasury. When the Fed operates at a loss, the Treasury does not transfer income to the Fed; instead, the Fed accounts for the stock of these losses as a deferred asset; it is an accounting measure that the Fed anticipates paying off when its “hedge fund” is again profitable. As of May 3, 2023, this deferred asset stood at -$54.5 billion.12

10Levin et al. (2022) discuss impacts of higher interest rates on the Fed’s expanded balance sheet.
11The Federal Reserve earns income primarily from interest earned on the securities it holds and from its provision of services to banks and government agencies. The Fed’s expenses consist mainly of interest payments to banks, operating expenses, and miscellaneous other items. Its earnings net of expenses are distributed in one of three ways: 1) remittances to the Treasury; 2) as dividends to member banks; 3) as earnings retained in the Reserve Bank’s surplus account; or else are 4) recorded in other comprehensive loss (in accordance with standard accounting procedures).
12As we can see in figure 4, the Fed’s balance sheet exceeds $8 trillion currently.
After September 14, 2022, rather than reporting the accumulated stock of losses as a deferred asset, we plot the first difference of the series.

Figure 12 plots the Fed’s earnings remitted to the Treasury. Strangely, the Fed’s balance sheet records its remittance to the Treasury as a flow when it is positive but as a stock when it is negative. To adjust for that peculiarity, we take first-differences of the Fed series starting September 14, 2022. Since then, the Fed has lost between $1 and $3 billion each week, and losses are growing. They are not counted as federal expenditures and not recorded in the federal budget deficit.

Along with private banks, the Federal Reserve has substantial unrealized losses on its balance sheet. Table 5 of SOMA (2023) records that in 2022 the Fed incurred $1,080.4 billion in unrealized losses. By the end of 2022, the Fed’s portfolio of Treasury securities had $672.8 billion in unrealized losses. The Fed has another $407.7 billion in unrealized losses on its MBS holdings, nearly all of which have maturities longer than ten years. The market value of the Fed’s Treasury portfolio fell between 12.0 and 12.5% in 2022.

In early March 2022, three midsize US banks failed, Silicon Valley Bank, Signature Bank, and Silvergate Capital Corp. When they understood that the large unrealized losses on these banks’ assets were worth less than their liabilities, depositors exercised their options to withdraw funds. The Federal Deposit Insurance Corporation (FDIC) took over the three banks and almost

---

13 These unrealized losses have no effect on the Fed’s recorded income or remittances to the Treasury unless it sells the securities and the losses are realized.
immediately agreed to insure all depositors, including those over the prior limit of $250,000.

To head off more bank runs, the Federal Home Loan Banks (FHLB) began accepting mortgages as collateral for high-interest loans to commercial banks, thus joining the Fed as lender of last resort. In addition, the Federal Reserve started a Bank Term Funding Program (BTFP) through which it makes loans up to one year maturity to banks and other depository institutions in exchange for collateral in US Treasuries, US agency securities, and US agency mortgage-backed securities that it does not mark to market. In a significant break from longstanding discount window policy that had adhered to a “Bagehot rule” that “seeks to value securities collateral at a fair market value estimate,” Fed will now value the collateralized assets at par under the BTFP.

Banks quickly signed up for this new Fed lending facility: figure 4a indicates that the Federal Reserve’s balance sheet increased in size by nearly $400 billion in two weeks. This increase was driven by an increase of $300 billion in private securities discounted by the Fed and by an increase of $60 billion in Treasury securities held by the Fed under repurchase agreements. The Fed used increases in bank reserves and reverse repurchase agreements to acquire these additional assets.

By valuing collateral at par, the Fed has created an asymmetric payoff that encourages banks to employ a “Hail Mary” strategy analyzed by Silber (2021): the Fed provides troubled banks an incentive to gamble for resurrection by buying high-coupon long-duration Treasury bonds whose values swing dramatically with changes in interest rates. If long-term rates fall, the banks will earn capital gains; but if interest rates continue to rise, these bonds will incur capital losses that the banks will pass off to the Fed and the FDIC.

4.4 Sensitivity of Bond Values to Interest Rate and Inflation Risks

Prices of long-term bonds are more sensitive to interest rate changes than are prices of short-term bonds. Let’s look at the maturity structure of the Treasury’s portfolio of outstanding securities. Figure 13a reports dollars (both coupon and principal payments) that the Treasury has promised to pay its creditors each year for the subsequent 30 years as of December 2019 and December 2022. At almost all maturities, the number of dollars promised by the Treasury increased over the COVID period.

To measure the sensitivity of the market value of Treasury debt to changes in interest rates, we construct two statistics that summarize the debt service profile. Figure 13b plots the modified Macaulay’s duration, denoted by $D^*$, and the average maturity of the Treasury’s promised cash-flows (both coupon and principal payments) on December 31 of each year. For the most recent

---

14In figures 13a and 13b we use marketable debt held by the public, which includes debt held by both private investors and the Federal Reserve. Thus we exclude nonmarketable debt, such as savings bonds, and debt held by government agencies and trust funds.

15We treat principal and coupon payments symmetrically. The US Treasury typically reports the average maturity of just its promised principal payments; see for example, Table FD-5 of the Treasury Bulletin. Hence, our measure of average maturity is longer than the Treasury’s measure.
three years, values of these two series along with implied yields to maturity were:

<table>
<thead>
<tr>
<th></th>
<th>December 31 of</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2020</td>
</tr>
<tr>
<td>average maturity (in years)</td>
<td>6.499</td>
</tr>
<tr>
<td>modified duration (in years)</td>
<td>5.974</td>
</tr>
<tr>
<td>yield to maturity (percent)</td>
<td>0.827</td>
</tr>
</tbody>
</table>

Although the average maturity of the debt rose in 2022, durations fell as yields increased; in general the duration of a promised cash flow and the sensitivity of its price to interest rate risk are lower when yields across maturities are higher.

To measure the impact on the market value of Treasury debt from a one basis point (or 0.01 percentage point) parallel shift in Treasury yields across all maturities, we use a textbook formula that relates changes in the yield to maturity ($\Delta y$) to change in bond prices:

$$\frac{\Delta P}{P} = -D^* \times \Delta y. \quad (3)$$

At the end of 2021, a one basis point increase in the yield would have led to a 0.062% decrease in the market value of the debt. Using formula (3) provides back-of-the-envelope estimates for the decrease in the market value of the Treasury’s portfolio of marketable securities of -2.7% and...
-15.0% in 2021 and 2022 respectively.\textsuperscript{16}

The Federal Reserve’s holdings of Treasuries are tilted toward the longer end of the maturity spectrum. In December 2022, $17.8 trillion in marketable notes and bonds were outstanding. The Fed owned $4.7 trillion or 26.5% of these. Through its purchases of long-term Treasuries and mortgage backed securities, the Federal Reserve has transferred duration risk from private investors to itself, an important aspect of the Fed’s quantitative easing program.

Table 1 indicates that in 2022 the reduction in the debt/GDP ratio due to inflation more than offset increased borrowing necessitated by the primary deficit.\textsuperscript{17} An opportunistic government’s gains from using surprise inflation to reduce its debt/GDP ratio rise with the duration and size of its debt. Private investors have incentives to understand that. Missale and Blanchard (1994) describe how investors who fear confiscatory surprise inflations can respond to prevent governments from being able to issue long duration debt. Nevertheless, panel 13b shows that although the duration of the US Treasury portfolio has declined recently, it remains high relative to what it was before 2010.

5 Taxes, Spending, and Debt

We now compare paths of spending, taxes and debt during and after the US War on COVID to paths during and after other major US wars. We detect patterns that endure from the early 1800s to the 1980s:

- During times of peace, the US federal government covered its ordinary expenditures with taxes.

- During four large wars – the War of 1812, the Civil War, World War I, and World War II – the US mostly just issued debt.

- During each of these four big wars, taxes increased but much less than spending.

- Although both expenditures and taxes fell after each of these big four wars, taxes stayed high enough to sustain post-war primary surpluses.

- After all four of these big wars, as fractions of GDP expenditures failed to return to their pre-war levels. Instead, the federal government grew during each of these four wars and stayed higher permanently. Thus, over the last 230 years, wartime federal expenditures always had both temporary and permanent components. And so did taxes

\textsuperscript{16}In section 4.2, we reported losses for the aggregate Treasury portfolio of -1.0% and -9.4% in 2021 and 2022 respectively.

\textsuperscript{17}Hall and Sargent (2022) estimate that inflation accounted for 71% of the post-World War II reduction in the debt/GDP ratio; but, in 1945 a much large share of the debt held by private investors consisted of longer-term Treasury notes and bonds than is the case today.
Some, but not all, of these patterns prevail during the War on COVID.

- The federal government paid for the large unexpected surge in expenditures in 2020 and 2021 mostly by borrowing. But unlike those earlier big wars, at least so far taxes have not been increased enough to sustain a post-war primary surplus.

- Consistent with historical patterns, the CBO (2023c) projects expenditures as a share of GDP will be permanently higher from 2023 to 2033 than they were prior to the pandemic. Inconsistent with historical patterns, tax revenues as a share of GDP are not projected to increase relative to pre-pandemic levels.

- President Biden and the House Republicans have each proposed alternative budgets; under both proposals, for the next ten years the federal government will run primary deficits – not surpluses.

- In sharp contrast to US history, CBO (2023c) projects that the par value of federal debt as a share of GDP will increase – not decrease – over the next ten years.

5.1 Permanent Expenditure Increases

In figure 14, we plot US federal government receipts and expenditures from 1790 to 2033. During the War of 1812, the Civil War, World War I, and World War II government spending rose while taxes increased much less. Hence, these wars were largely financed by issuing debt and printing money. As Hall and Sargent (2022) documented, taxes only accounted for 20.8% and 30.2% of the revenue that the US raised to fight World War I and World II, respectively.

After each of the four big wars, government spending fell while tax revenues remained elevated, so the government ran a primary surplus for many years. These primary surpluses were used to service debt incurred during the war. These patterns are broadly consistent with the optimal response from a Barro (1979) tax-smoothing model to a temporary government spending shock.

Those wartime spending shocks were just temporary. Large US wars have been followed by enduring changes in the size and composition of government spending and taxation. As can be seen clearly in figure 14, the War of 1812, the Civil War, World War I, and World War II were followed by permanent rises in federal expenditures as fractions of GDP. More generally, Edwards (2014) examined 11 US wars and estimated that for every $1 increase in wartime spending, the US federal government spent another $0.50 (in present value) over the following 80 years on transfer payments and in-kind benefits provided to veterans and their spouses and other survivors.18

Table 4 reports average spending and revenue as shares of GDP for the pre-war, war, and post-war periods for four large US wars. The table confirms impressions that can be gleaned

---

18Rothbard (2017, chs. 12-13) described forces that contributed to outcomes during and after World War I.
Outlays are net of official interest payments. 1790-2010 annual by fiscal year; 2011-2022 monthly data aggregated to 6-month periods. Outlays and Receipts from 2023-2033 are computed using CBO (2023c) projections.

from figure 14. After each major war, government spending as a share of GDP \((G/Y)\) increased relative to pre-war values. This pattern will likely continue post-COVID.

Federal financing of the War on COVID shares some, but not all, patterns detected across previous wartime expenditure surges. In the War on COVID, taxes have accounted for only 4.0% of the total revenue raised, a far smaller share than was raised in prior wars. To think about prospects after the War on COVID, we rely on the analysis of the Congressional Budget Office (CBO) and the Office of Management and Budget (OMB) to project paths of taxes, expenditures, and debt.

On February 15, 2023, the CBO released its *Budget and Economic Outlook: 2023 to 2033*. Assuming as it must that current laws governing taxes and spending do not change, the CBO projects that for the next ten years, federal government expenditures (net of interest payments) will average more than 21% of GDP, up from 19.2% of GDP prior to COVID. Likewise, the CBO projects that revenue as a percent of GDP will increase relative to its pre-war level. However, in contrast to previous wars, the CBO projects that revenues will be lower than expenditures. So the CBO projects that the federal government will run primary deficits.

On March 9, 2023, President Biden proposed a budget for fiscal years 2024-2033. It proposes higher outlays and higher revenues than the CBO did. According to Biden’s budget, the primary deficit as a percent of GDP will decrease over time.

In response to the looming statutory debt limit that we discuss in the next section, Republicans
<table>
<thead>
<tr>
<th>War</th>
<th>Start - End (US entry -)</th>
<th>Fiscal prewar</th>
<th>Fiscal war</th>
<th>Fiscal postwar</th>
<th>T/Y prewar</th>
<th>T/Y war</th>
<th>T/Y postwar</th>
</tr>
</thead>
<tbody>
<tr>
<td>War of 1812</td>
<td>1812:6 - 1815:2</td>
<td>1812-1815</td>
<td>0.88</td>
<td>2.72</td>
<td>1.82</td>
<td>1.95</td>
<td>1.37</td>
</tr>
<tr>
<td>Civil War (Union)</td>
<td>1861:4 - 1865:4</td>
<td>1861-1865</td>
<td>1.58</td>
<td>7.79</td>
<td>2.50</td>
<td>1.42</td>
<td>1.87</td>
</tr>
<tr>
<td>World War I</td>
<td>1914:7 - 1918:11</td>
<td>1915-1919</td>
<td>1.88</td>
<td>9.10</td>
<td>3.17</td>
<td>1.94</td>
<td>3.30</td>
</tr>
<tr>
<td></td>
<td>(1917:4 -)</td>
<td>1917-1919</td>
<td>1.76</td>
<td>14.07</td>
<td>3.17</td>
<td>1.80</td>
<td>4.39</td>
</tr>
<tr>
<td>World War II</td>
<td>1939:9 - 1945:8</td>
<td>1940-1946</td>
<td>8.21</td>
<td>25.43</td>
<td>14.00</td>
<td>5.52</td>
<td>12.89</td>
</tr>
<tr>
<td></td>
<td>(1941:12 -)</td>
<td>1942-1946</td>
<td>8.31</td>
<td>31.97</td>
<td>14.00</td>
<td>6.15</td>
<td>15.43</td>
</tr>
</tbody>
</table>

Table 4: Average government spending net of interest payments and tax receipts as a percent of GDP for the five years prior to each war, for the war period, and for the ten years following the war.

The postwar numbers for COVID-19 are computed using CBO (2023a) projections.

in the House of Representatives passed the Limit, Save, Grow Act of 2023 on April 26, 2023. In this legislation, in exchange for a modest increase in the debt limit, the Republicans propose to set fiscal 2024 discretionary spending equal to 2022 spending levels.\textsuperscript{19} Discretionary spending growth would then be limited to 1% per year until 2033, but it makes no changes to entitlement and other mandatory spending programs that comprise 71% percent of federal non-interest expenditures. The legislation increases revenues by a small amount each year, $35 billion per year on average.

In figures 15 and 16, we compare the President’s budget and the House Republican budget to the projections made by the CBO (2023c).\textsuperscript{20} In contrast to both the CBO projections under the status quo and the President’s proposed budget, under the House Republican plan, spending (net of interest) will return to pre-COVID levels as a share of GDP. Nevertheless, under all three budget paths, the federal government would run primary deficits – not surpluses – for the next decade. While neither the President’s nor the House Republicans’ budgets is likely to become law in its current form, there are no proposals considering returning to the historical norm of post-war primary surpluses.

Actually, paths of the primary deficit under the President’s and House Republicans’ budgets are pretty similar after 2025. In fiscal year 2026, under the President’s budget, the primary deficit is projected to be 2.2% of GDP, while under the Republican plan, it will be 1.9% while under

\textsuperscript{19}Under this Act, Congress and the President will have to address the debt limit again in 2024.

\textsuperscript{20}We assume that the path of GDP is the same under all three budget proposals.
Outlays are net of official interest payments. 1989-2010 annual by fiscal year; 2011-2022 monthly data aggregated to 6-month periods. Outlays and Receipts for 2023-2033 are from Table 1-1 of CBO (2023c), Table S-4 of OMB (2023), and Tables 1 and 3 of CBO (2023b). GDP for 2023-2033 is from CBO (2023a).

the status quo the primary deficit will be 3.0%. Under the President’s budget, reductions in the budget relative to current laws) are driven mainly by increases in revenues; under the Republican’s budget, they are achieved primarily through spending cuts.

5.2 Debt/GDP’s Destiny

Prospective primary deficits are likely to cause the par value of US Treasury debt to increase over the next ten years. Some analysts forecast that these deficits will drive large debt/GDP ratio increases. In Table 1-3 of CBO (2023a), the CBO projects alternative measures of the debt/GDP ratio. Ominously, the CBO reports

Debt held by the Public is projected to rise in relation to the size of the economy each year, reaching 118 percent of GDP by 2033 – which would be the highest level ever recorded. Debt would continue to grow beyond 2033 if current laws generally remained unchanged.

Let’s assess this claim.

Debt held by the Public includes holdings by the Federal Reserve. To align the CBO’s projections with our analysis, we measure the debt as Debt held by the Public - Federal Reserve’s Holdings of Debt Held by the Public. The CBO’s measure is very close to our measure of Debt held
Figure 16: US Federal Government Primary Deficits: 1989-2033

1989-2010 annual by fiscal year; 2011-2022 monthly data aggregated to 6-month periods; 2023-2033 are computed using CBO (2023c) projections, Table S-4 of OMB (2023), and Tables 1 and 3 of CBO (2023b). GDP for 2023-2033 is from CBO (2023a).

<table>
<thead>
<tr>
<th></th>
<th>2022:9</th>
<th>2033:9</th>
<th>change</th>
</tr>
</thead>
<tbody>
<tr>
<td>COVID-19</td>
<td>70.2</td>
<td>96.9</td>
<td>27.7</td>
</tr>
</tbody>
</table>

Table 5 decomposes this projection using equation (2). The table asserts that the ratio of privately-held debt to GDP will rise 26.2 percentage points from 70.2 in September 2022 to 96.4 in September 2033. Payouts to Treasury creditors and primary deficits drive this projection.

Other includes other means and the cross term.

by Private Investors. Using projections of total outlays, revenue, net interest payments, and Federal Reserve holdings of debt and forecasts of real and nominal GDP, provided in the CBO’s data supplements, the dashed line in figure 17 projects a path of the market value of privately held debt as a percent of GDP.

Table 5 decomposes this projection using equation (2). The table asserts that the ratio of privately-held debt to GDP will rise 26.2 percentage points from 70.2 in September 2022 to 96.4 in September 2033. Payouts to Treasury creditors and primary deficits drive this projection.

21Since the CBO’s measure of Federal Financial Assets is much broader than our measure of Net Treasury Balances, we do not net out either series from either measure of debt. Unlike the analysis earlier in this paper, we do not net out any asset holdings by the Federal Reserve or other assets held by the Treasury.

22We measure money growth by the change in the Federal Reserve’s Holdings of Debt Held by the Public.
Figure 17: Market Value of Privately-Held Debt, Actual and Projected, as Percents of GDP.

Actual data are monthly through September 2022.
Dashed line: Annual projections by fiscal year based on the projections and forecasts underlying CBO (2023c).
Dotted line: Annual projections by fiscal year based on the projections and forecasts underlying CBO (2023c) except that the nominal return on debt is assumed to be 1.5% per year.

CBO forecasts for the nominal returns on US Treasury debt, real GDP growth, and inflation (as measured by the GDP deflator) underlie the projection. The CBO forecasts that from 2023 to 2033, these series will grow on average at the annual rates below:

<table>
<thead>
<tr>
<th>average growth rate</th>
<th>2023-2033</th>
</tr>
</thead>
<tbody>
<tr>
<td>nominal returns</td>
<td>3.6%</td>
</tr>
<tr>
<td>real GDP growth</td>
<td>1.8%</td>
</tr>
<tr>
<td>inflation (GDP deflator)</td>
<td>2.3%</td>
</tr>
</tbody>
</table>

Congress has constrained the CBO to measure US Treasury debt and interest payments by the accounting measure used by the US Treasury. Hence implicit in these forecasts are assumptions that the market value of the debt always equals its par value and that US creditors never incur capital losses. A cautionary note is that since the US went off the gold standard in 1934, bondholders have received low returns after large debt surges; nor has inflation been as tame as the CBO projects.

Because CBO assumptions are inconsistent with historical averages, we reconstruct projections by assuming that bondholders earn nominal returns of only 1.5% per year. Since we continue to assume that inflation will average 2.3%, bondholders will earn negative real returns. The dotted
line in figure 17 presents our reconstructed projection. Now the debt/GDP ratio stabilizes just below 80%.

6 What Debt Limit?

The US statutory debt limit puts an upper bound on the par value of interest-bearing Treasury debt. On December 16, 2021, Congress set this statutory upper bound to $31,381,463 million, making it illegal for the Treasury to issue debt with a par value exceeding this amount. On January 19, 2023, the Treasury reached this limit and declared a “debt issuance suspension period” during which it can take “extraordinary measures” to borrow additional funds without violating the limit.

On May 1, 2023, US Treasury Secretary Janet Yellen wrote to Congressional leaders that, without Congressional action to increase the debt limit, the Treasury’s ability to borrow using extraordinary measures will be exhausted in early June, possibly as soon as June 1.23 After that, a conflict of federal laws seems at first sight to present the US Treasury with three unpalatable options:

1. Ignore the debt limit and continue to honor promised principal and coupon payments along with other spending commitments already authorized by Congress. In this case, the US Treasury violates the debt limit.

2. Prioritize debt servicing but suspend some other authorized government spending. In this case, the US Treasury respects the debt limit but breaks other laws.

3. Suspend principal and/or coupon payments to some or all bondholders. In this case, the US Treasury would break the promises it made to its bondholders when it issued the debt, putting it into technical default.

Carrying out any of these options would imperil the “full faith and credit” of the federal government, perhaps triggering further declines in the value of US Treasury and other fixed-income securities, thus extending losses reported in section 4.2.

Our consolidated government budget constraint and our budget accounting point to two budget-feasible circumventions should Congress fails to raise the debt limit in time. Both respect that the debt limit is an upper bound on the par value of Treasury-issued debt.

The first circumvention starts by recognizing that the Federal Reserve borrows from the public by selling interest-bearing bank reserves and reverse repurchase agreements; although these IOUs are close substitutes for Treasury securities, they are not subject to the statutory debt limit. By

23Late April 2023 price movements in the ultra-short-term Treasury bill market imply that private investors also expect the Treasury’s exhaustion date will occur in June.
selectively defaulting only on Treasury securities owned by the Federal Reserve, the Treasury and the Fed can substitute reserves and reverse repos for Treasury-issued securities.

The second circumvention starts by noting that the statutory limit constrains outstanding promised principal payments but places no constraints on promised streams of coupons. By labeling payments as “coupons” rather than “principal,” the Treasury can reduce the par value of its debt leaving the market value of its debt unchanged.\footnote{It would cause measured interest payments to rise.}

Either of these circumventions allows the Treasury to pay its creditors while still making all promised payments to other recipients of government spending.

6.1 Replacing Treasury-issued Debt with Loans to the Federal Reserve

The Federal Reserve owns about $5.4 trillion in US Treasury securities. To finance these purchases, the Federal Reserve issues interest-bearing bank reserves and reverse repurchase agreements. These Federal Reserve liabilities are interest-bearing federal debt, but they do count toward the statutory debt limit.

In a recent op-ed, Kupiec and Pollock (2023) noted that if the Treasury selectively defaulted on its securities held by the Fed, the Fed and Treasury could substitute interest-bearing loans to the Fed for interest-bearing Treasury securities and thus circumvent the debt limit. Here is how the scheme would work:

1. The Treasury would stop making principal and coupon payments to the Federal Reserve on the Treasury securities owned by the Fed.

2. In a mirror-image of the liability item on the Fed’s balance sheet “Earning Remittances to due to the US Treasury” (see figure 12), the Fed would create a new asset item, “Interest Income Receivable from Treasury,” on its balance sheet.

3. To cover the reduction in income that the Fed earns on its portfolio of assets from this selective default, the Fed would increase its borrowing from banks in the form of reserve deposits and money market funds in the form of reverse repos. Its liability of remittances to the Treasury would also grow.

While the Fed’s liabilities would increase one-for-one to match the growing stock of Treasury interest in arrears on the asset side of its balance sheet, these increased liabilities – a form of federal debt – would not count against the statutory debt limit.

6.2 Replacing Principal Payments with Coupon Payments

As we noted in section 2, the US Treasury and other federal government agencies mismeasure their debts and interest payments; federal accounts record debt at par values and it interest
payments as the sum of the coupon payments on its notes and bonds and the accrued interest on the zero-coupon Treasury bills.

By issuing high-coupon bonds, the Treasury would just be relabeling promised principal payments as coupon payments. Note that a 20-year Treasury bond comprises a single principal payment, due at maturity, bundled together with 40 coupon payments, one every six months over the intervening 20 years. Of course, since the price of the original bond is just the sum of the prices of the 41 individual zero-coupon securities, unbundling should have no impact on the market value of the bundle of promises that comprise the bond. From an economic standpoint, each of these 41 securities is just a promise to pay a dollar at a date in the future, and thus the labels “coupon payment” and “principal payment” are irrelevant from the standpoint of what the government owes its creditors. However, from the perspective of the statutory debt limit, these labels matter. Promises labeled principal payments count against the debt limit. Promises labeled coupon or interest payments do not. The US Treasury could lower the par value of outstanding debt by replacing bonds with low coupon rates with high-coupon bonds.

For example, suppose that the Treasury were to issue a $100 twenty-year bond with a 50% annual coupon rate. If the present value of the promised cash stream were to be discounted at a 6% annual rate (i.e., a flat yield curve), the bond would sell for $604.68, and the Treasury would raise this much in new funding. The market value of the debt would rise by $604.68, but the par value would rise by only $100. Interest payments, as measured by the government, would be $50 per year. But assuming that the yield curve remains constant at 6%, the return on this bond would be 6% each year despite the high coupon rate.

Some state governments already engage in this practice. For example, as noted by The Volcker Alliance (2015), in 2011 and 2012, the State of New Jersey sold securities bearing coupons above market levels. As a result, the State recorded the increase in debt at the par value and the premium above par as revenue.
References


