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ABSTRACT

We analyze real returns on U.S. and U.K. government debt during major wars and the COVID-19 pandemic over the past three centuries. Wars are associated with sharply negative real returns on outstanding government debt, with returns falling far below economic growth, in contrast to peacetime periods when returns exceed growth. Elevated surprise inflation and financial repression account for a cumulative 31% wedge between returns and growth over four years of war, implying that bondholders bear a substantial share of wartime fiscal costs. During wartime, government bonds also systematically underperform risky assets.

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1 Introduction

Policymakers and economists typically think of U.S. Treasurys as safe, highly liquid assets (Holmström and Tirole, 1998; Longstaff, 2004; Krishnamurthy and Vissing-Jorgensen, 2012). This safe debt view informs policymaking. For example, financial regulators assume that sovereign debt is safe when they set capital requirements for banks. As another example, policymakers expected to see a decline in Treasury yields at the onset of the COVID-19 pandemic, fueled by the typical flight to safety. When yields increased, Federal Reserve policymakers inferred that U.S. Treasury markets were not functioning properly and launched a massive intervention (Cram, Kung, and Lustig, 2024).

We examine the real returns on government debt in the U.S. and U.K., the world's safe asset suppliers over the past three centuries, in wartime periods and the COVID-19 pandemic. These episodes are marked by large increases in government spending of 7% of GDP per annum in the first 4 years on average. Contrary to the safe asset view, we find that wars and epidemics are marked by significant losses for bondholders. Across all episodes, bondholders in the U.S. and the U.K. suffered a 14% real loss in the first 4 years. Government bonds even underperformed risky asset classes such as equities and housing. In this respect, wars are fundamentally different from financial crises and economic recessions.

What leads government bonds to underperform so dramatically during wars? We find that surprise inflation played a significant role in eroding the real returns of government bonds. The cumulative inflation rate across all U.S. and U.K. wars was 20% in the first four years of war. Our empirical findings are consistent with recent evidence in Hall and Sargent (2021); Barro and Bianchi (2023); Acalin and Ball (2023) for COVID-19 and the world wars. They lend support to theories that identify the path of future government deficits as drivers of inflation, starting with Sargent and Wallace (1981), Leeper (1991), Sims (1994), Woodford (1995), Cochrane (1998), and Bassetto (2002).

Another major contributing factor to low real bond returns during wartime is financial repression, i.e., governments lowering their cost of funding either through central bank intervention or financial regulation (Reinhart, Kirkegaard, and Sbrancia, 2011; Chien, Cole, and Lustig, 2023; Payne and Szőke, 2025; Jeanne, 2025; Chien, Jiang, Leombroni, and Lustig, 2025; Itskhoki and Mukhin, 2025).[1] Both the U.S. and the U.K. have used some of the tools of financial repression during almost every war. The hallmark of financial repression is that nominal bond returns increase (by 5% points over 4 years), meaning that nominal yields decline even as inflation increases.

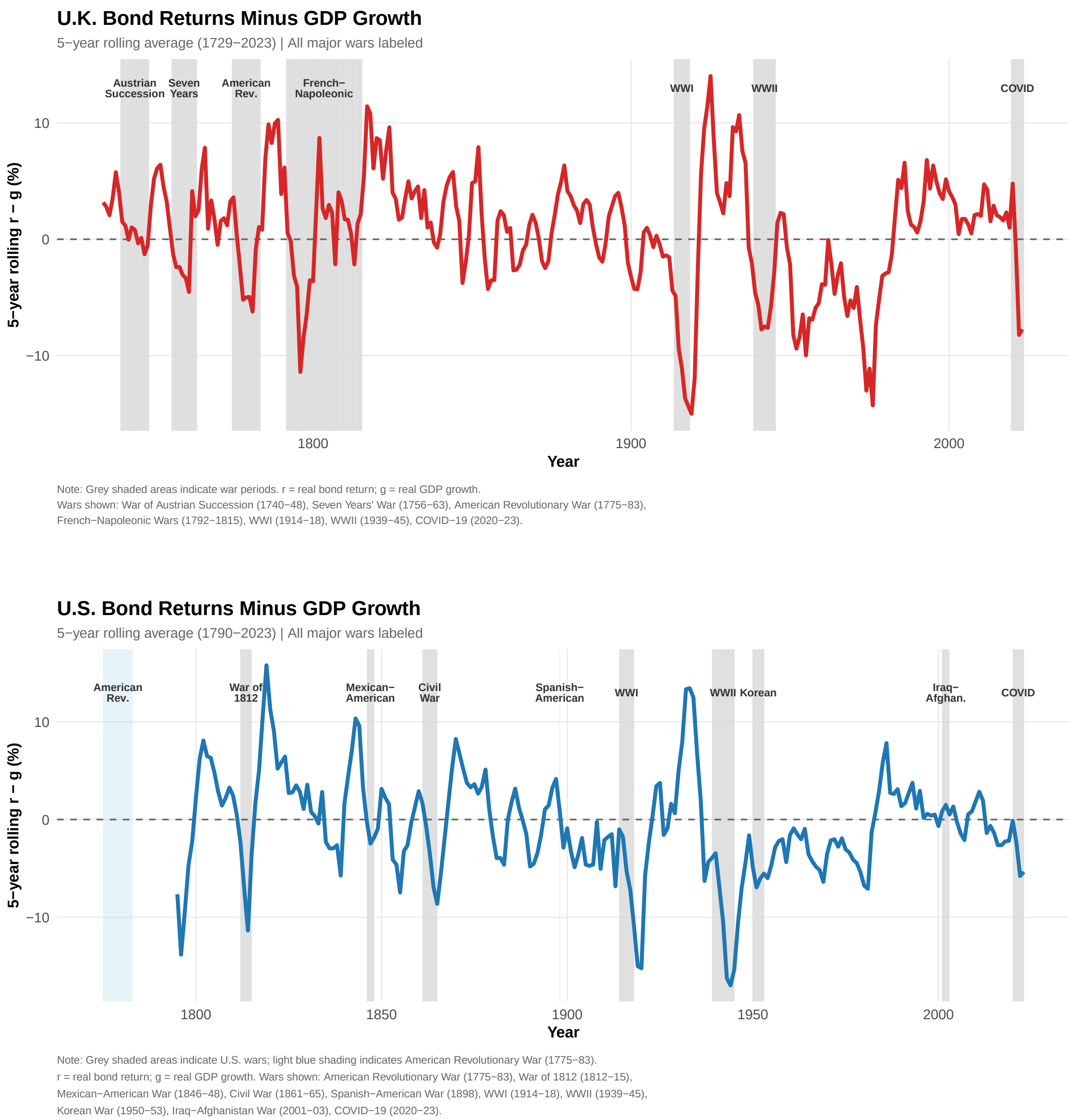
Over the entire 1790–2023 U.S. sample, the average real return on U.S. Treasurys (r) is lower than the average real growth rate of GDP (g), which led to Blanchard (2019)'s observation that there may be no fiscal cost to running deficits.[2] However, average $r - g$ is heavily influenced by war episodes and the pandemic, in both the U.S. and the U.K., as shown in Figure 1. Across all U.K. and U.S. wars and the pandemic, r is below g by 30% points cumulatively over the first 4 years of a war. If we exclude wars from the U.S. sample, then r actually exceeds g by 44 bps. These statistics suggest a more nuanced answer to the fiscal sustainability question. In particular, there are large fiscal costs associated with deficits, even when average r is close to (or slightly below) g. Governments may be able to lower their high debt/GDP ratios substantially in wartime without explicit default, but only if they are willing to inflict losses on bondholders and savers through surprise inflation and financial repression.

Blanchard (2019) and Furman and Summers (2020) have argued that the run-up in debt/GDP ratios in the U.S. and other advanced economies can be rationalized by low (future) $r - g$. Jiang, Lustig, Van Nieuwerburgh, and Xiaolan (2024b) find no evidence that higher debt/GDP ratio predicts higher future surpluses (cash flows) or lower $r - g$ (growth-adjusted discount rates) for the U.S. in the post-war period. Neither the cash flow not the discount rate channel pushes the debt/GDP ratio back to its mean. As a result, the U.S. debt/GDP ratio is highly persistent. This paper clarifies that large unfunded spending increases during wars and pandemics are different from other periods. High debt/GDP ratios in wartime does predict low $r - g$ because of a surge in inflation and

[1] Governments can issue non-marketable debt. They can urge banks and other non-bank financial institutions to buy more government bonds, or incentivize government bond holdings through macro-prudential regulation. Central banks can absorb the issuance of government bonds.

[2] In the wake of the secular decline in U.S. long rates, economists have explored whether the U.S. economy is dynamically inefficient ($r < g$) and its implications for debt sustainability (Blanchard, 2019; Mehrotra and Sergeyev, 2021; Aguiar, Amador, and Arellano, 2021; Mian, Straub, and Sufi, 2021) in models without aggregate risk.

Figure 1: Bond Returns Minus GDP Growth



Notes: The top panel plots the annual real bond returns minus real GDP growth for the U.K. and the bottom panel for the U.S., in 5-year rolling windows. Gray shades denote major war episodes.

financial repression.

Governments face an inherent trade-off between insuring taxpayers and protecting bondholders (Jiang, Lustig, Van Nieuwerburgh, and Xiaolan, 2026); preserving the safety of debt necessitates raising taxes during downturns. We find that governments force bondholders to bear a large share of the fiscal burden of the large government spending shocks associated with wars and pandemics. This may be desirable: With distortionary labor income taxation, the government may find it optimal to shift the burden of large spending shocks to bondholders (Lucas and Stokey, 1983; Buera and Nicolini, 2004). However, when the government chooses this path, its debt is no longer safe. Its cost of funding increases, as bondholders anticipate losses in high marginal utility states of the world (Gomez Cram, Kung, Lustig, and Zeke, 2025). Our work connects with the recent literature on the role of government policies in manufacturing safe or risky debt (see Liu, Schmid, and Yaron, 2021; Jiang, Sargent, Wang, and Yang, 2022; Jiang, Lustig, Van Nieuwerburgh, and Xiaolan, 2026; Jiang, Richmond, and Zhang, 2025). The joint monetary-fiscal policy stance affects the safety of nominal government bonds.

Wars and pandemics are quite different from economic recessions and financial crises. During the latter episodes, we find that U.S. and U.K. government bonds outperform risky assets such as stocks, consistent with bonds' perceived safe-haven role (Krishnamurthy and Vissing-Jorgensen, 2012; Jiang, Krishnamurthy, and Lustig, 2021). It is this perceived safety and liquidity that makes Treasurys expensive on average.[3] A key difference with recessions and financial crises is that, during major wars, government spending increases are substantially larger, and bondholders are frequently required to bear a substantial share of that large fiscal burden. Our findings deepen the equity premium puzzle, which becomes a puzzle of low yields on Treasurys, especially during wartime, rather than high returns on equities.

[3]One way to express that Treasurys are expensive is to compare the valuation of the outstanding Treasury portfolio to the value of the underlying collateral, the present discounted value of future government surpluses. (Jiang, Lustig, Van Nieuwerburgh, and Xiaolan, 2024a) show that the former exceeds the latter when the present-value is computed from a realistic asset pricing model. This discrepancy could potentially be resolved when good news about government surpluses occurs in high-marginal utility states of the world. During wars, the stand-in investor experiences sharper declines in consumption than during financial crises or recessions (Muir, 2017). Wars are thus an example of high marginal utility states with deteriorating surpluses, the opposite covariance of what is needed to resolve the puzzle.

Wars are also somewhat different from consumption disasters. In a large cross-country panel of consumption disasters, Nakamura, Steinsson, Barro, and Ursúa (2013) find that bonds post average real returns of -3%. While negative, bonds still significantly outperform stocks in consumption disasters. We find more severe losses in the government bond portfolio than in equities during war episodes. Standard Rietz (1988); Barro (2006) rare disaster model calibrations do not explain this pattern.

Existing studies have documented negative bond returns during wartime. Rigobon and Sack (2005) analyzes high-frequency bond market reactions to Iraq war news and finds substantial increases in yields. Schmelzing (2019) shows that wars often coincide with yield spikes and poor real returns, though the focus of this study is on the long-run decline in real rates and persistent negative $r - g$ gaps. Miller, Paron, and Wachter (2025) attribute the secular decline in yields to a persistent decline in the risk of sovereign default, either through inflation or explicit default, but argue that default risk increased again after COVID. Ellison and Scott (2020a) provide evidence of large wartime losses for U.K. bondholders relative to peacetime. Our paper is the first to present consistent, systematic evidence on the wartime performance of the entire portfolio of government bonds compared to other asset classes.

Our work is closest to the work by Hall and Sargent (2021) that draws parallels between the COVID-19 pandemic and wars. Lehner, Payne, Shurtleff, and Szőke (2025) carefully estimate the U.S. Treasury yield curve and compare it with corporate bond yields dating back to 1860, providing a comprehensive analysis of the U.S. government funding advantage across major episodes in U.S. fiscal history. Payne and Szőke (2025) examine the long-term effects of government policies including financial repression on the valuation of government bonds, without focusing specifically on wartime. Meyer, Reinhart, and Trebesch (2022) show that since 1815 foreign-currency sovereign bonds have delivered returns exceeding those of U.K. and U.S. government bonds despite frequent defaults. Our paper, by comparison, focuses on wartime returns in the government bond markets of the major safe-asset suppliers, the U.K. and the U.S.

There is a large literature that identifies exogenous shocks to defense spending using a narrative approach (Ramey, 2011) to estimate the dynamic real effects of spending shocks on economic activity. We set out to measure real bond returns in response to large, largely unfunded increases in government spending.

The paper is organized as follows. Section 2 outlines the data sources for our three centuries of government bond return data and describes the criteria used to identify major wars and crises. Section 3 analyzes government bond returns during wartime and compares them to contemporaneous stock returns and returns of other asset classes. Section 4 contrasts the wartime bond return patterns with those observed during financial crises. Section 5 concludes.

2 Historical Data

2.1 Bond and Equity Returns

We compute the return on all outstanding bonds issued by the U.K. central government between 1729 and 2023. To do so, we use the database constructed by Ellison and Scott (2020a) that comprises individual bond prices and quantities for bonds issued by the U.K. central government. The 2019–2023 bond portfolio return is obtained from the total return index from Heriot-Watt British Government Securities Database. Our portfolio only includes marketable debt issued by the central government. The U.K. inflation data (1729–2020) is from Global Financial Database, and the inflation data (2021–2023) is from FRED.

For the U.S., we compute the return on all marketable debt issued by the federal government from 1790 to 2023. To construct the sample, we use two different sources for the return on the outstanding portfolio of marketable Treasurys. First, for the 1790–2020 sample, we obtain the annual return on the U.S. bond portfolio from Hall and Sargent (2011). For the 2021–2023 sample, we used the CRSP Treasury Database and constructed aggregate bond returns from security-level data. The U.S. inflation data (1929–2023) is from NIPA Table 1.1.4. The historical U.S. inflation data (1790–1928) is from Global Financial Database. Appendix B provides details on data construction.

2.2 Summary Statistics

Table 1 reports the summary statistics of bond real returns and the return differentials between bond and stock. On average, U.K. and U.S. bonds earn a real return between 2% and 3%. Bond returns are persistently lower than stock returns, with the median bond return falling short of the equity return by 3.49% in the U.K. and 2.86% in the U.S. However, there are periods when bond returns exceed equity returns. For example, in the U.K., the top decile of bond returns surpasses equity returns by 10.35%. This difference is even more pronounced in the U.S., where the top decile bond return exceeds the equity return by 14.18%. The bond-equity return spread exhibits substantial variation over the sample period.

Table 1: Summary Statistics of Bond Returns

Real Return	Mean	Std. Dev.	Q10	Q50	Q90	Skewness	ACF
U.K. Bond (Real)	2.30	9.16	−8.05	3.22	11.64	−0.14	0.13
U.K. Bond (Nominal)	4.00	7.74	−4.76	3.71	12.89	0.42	0.02
U.K. Bond − Stock	−3.03	12.14	−14.48	−3.49	10.35	0.19	−0.10
U.K. Growth (Real)	1.82	3.11	−2.08	2.03	5.44	−0.38	0.00
U.K. Inflation	1.71	4.86	−3.36	1.27	7.50	0.74	0.58
U.S. Bond (Real)	2.91	7.85	−5.61	2.52	12.07	0.41	0.27
U.S. Bond (Nominal)	4.69	4.46	0.06	4.28	9.76	0.77	0.20
U.S. Bond − Stock	−3.49	14.54	−21.70	−2.86	14.18	0.47	0.08
U.S. Growth (Real)	3.75	4.36	−0.69	3.62	8.36	−0.19	0.30
U.S. Inflation	1.78	5.75	−4.80	1.77	8.47	0.03	0.35

Notes: The table reports summary statistics for nominal and real bond returns, bond returns minus stock returns, real growth, and inflation in the U.K. and the U.S. The U.K. sample covers 1729–2023, and the U.S. sample covers 1790–2023.

2.3 Wars

Central to our analysis is the identification of major wars, as our goal is to show how government bond returns behave during wars compared with other economic crises. Our selection of major wars is based on a baseline analysis of government defense expenditure and is guided by established references in the existing literature.

We also include the pandemic. Hall and Sargent (2022) argue that Covid-19 is comparable to the great wars of the 20th century: labor supply constraints, restrictions on international trade, surges in government spending not matched by increases in tax revenue, and significant expansions of central bank balance sheets. During WW-II, the Treasury and the Fed entered into an agreement to cap yields on long-term bonds. The Fed stood ready to accumulate large inventories of bonds to enforce the cap. When inflation spiked during the Korean war, the Fed ended its policy of yield curve control. The Fed did not enter into an explicit agreement with the Treasury during COVID, but it is plausible that central banks were trying to create fiscal space for governments to respond to the crisis.

2.3.1 U.K.

We begin with the list of wars involving the United Kingdom since 1700 compiled by Britannica.com.[4] Defense expenditure data are obtained from the U.K. Office for Budget Responsibility's Historical Public Finances Database. Table A.1 presents U.K. government defense expenditures as a share of GDP across major conflicts. The last column reports the change in the ratio of defense spending to GDP, where the change (Δ) is computed as the average in the defense spending/GDP ratio during the war years minus the defense spending/GDP ratio in the year prior to the onset of the war.

We construct our main testing sample for the U.K. based on the magnitude of the increase (Δ) in defense spending in the year prior to the onset of each war, as reported in the last column of Table A.1. Our primary sample includes wars associated with a significant rise in defense spending of at least 1% of GDP relative to the year before the war began.

Our primary sample includes six major wars: War of the Austrian Succession (1740-1748), the Seven Years War (1756–1763), the American Revolutionary War (1775–1783), the French–Napoleonic Revolutionary Wars (1792–1815)[5], WW-I (1914–1918), WW–II (1939–1945), and the Covid-19 Pandemic (2020–2023). On average, the U.K. government spent an extra 15.29% of GDP on defense per annum during wartime.

[4] https://www.britannica.com/topic/list-of-wars-2031197#ref328527

[5] We follow Ellison and Scott (2020a) in combining the French Revolution (1792-1799) and the Napoleonic Wars (1801-1815) into a single conflict spanning 1792 to 1815 in the robustness test.

Among the wars with the largest increases, we exclude the War of the Spanish Succession (1701–1714) and the Yamasee War (1715–1716) because they predate our data coverage period, which starts in 1729. We also do not analyze the War of 1812 as a separate event, as it is fully subsumed within the broader Napoleonic Wars. During the Boer War (1899–1902) and the Crimean War (1853–1856), government defense spending increased only modestly, by 2.69% and 1.27% of GDP, respectively. We exclude these conflicts from our primary analysis sample but include them as additional wars in our robustness exercises to remain consistent with the classification of major wars in the Historical Public Finances Database.

Although both the Greek Civil War and the Russian Civil War are associated with high levels of defense spending, they are not included in our testing sample. This exclusion reflects the fact that their incremental changes in defense expenditure are negative, as these conflicts occur adjacent to or partially overlap with major wars such as World War I and World War II. Consistent with this reasoning, Ellison and Scott (2020a) also excludes the Greek Civil War and the Russian Civil War from their analysis.

2.3.2 U.S.

We obtain the time series of U.S. federal defense expenditure (1800-2023) from `usgovernmentspending.com` and the nominal GDP data from Johnston and Williamson (2022) `measuringworth.com`. Table A.2 lists U.S. government defense expenditures as a share of GDP across these conflicts, as well as the wartime change in the defense spending/GDP ratio relative to the year preceding the war. The American Revolutionary War (1775–1783) is not included in our U.S. war sample, as the defense expenditure series for the U.S. is available only from 1800 onward.

We apply the same selection criteria to U.S. wars, selecting the wars with the largest positive increases in defense spending relative to the year prior to the onset of each war (as ranked in the last column of Table A.2). We exclude the Russian Civil War, which is adjacent to the major conflict—World War I. On average, the U.S. government spent an extra 4.04% of GDP on defense per annum during wartime.

The U.S. war periods considered in our baseline sample include the War of 1812 (1812–1815), the Mexican-American War (1846–1848), the Civil War (1861–1865), the Spanish-American War (1898), World War I (1914–1918), World War II (1939–1945), the Korean War (1950–1953), and the COVID-19 pandemic (2020–2023) and Iraq-Afghanistan War (2001-2003). We focus on the 2001–2003 period as the most significant phase of the Afghanistan war because it marked the foundational transformation of the conflict.[6] As a robustness check, we consider an alternative specification that defines the Iraq–Afghanistan War over the longer 2001–2011 period.

U.S. involvement in the Russian Civil War was relatively minor, focused on safeguarding military supplies. We also exclude the Bleeding Kansas conflict (1854–1859) from our primary sample because it was a relatively small-scale, regional conflict with a low defense-to-GDP ratio compared to the large-scale wars in our baseline sample. Moreover, the incremental increase in defense spending over 1854–1859 is only 0.17% of GDP—borderline positive and substantially smaller than that associated with other wars in our baseline sample. Nevertheless, we include the Bleeding Kansas conflict in our robustness tests.

2.4 Wars and Defense Spending

These wars had significant fiscal implications. In this paper, we use an event-study approach to systematically study the effects of wars. Let E_i denote the calendar year during which the war started, and let $K_{i,t} = t - E_i$ denote the relative time, i.e., the number of years between time t and the event year. By construction, $K_{i,t} = 0$ in the event year t. For each war, we include the five years before the war and all of the calendar years during

[6]Following the September 11 attacks, U.S. forces launched Operation Enduring Freedom in late 2001, leading to the rapid collapse of the Taliban regime and the installation of an interim Afghan authority. By 2003, NATO assumed command of the International Security Assistance Force, formalizing the internationalization of the mission. That same year, U.S. Secretary of Defense Donald Rumsfeld publicly declared an end to "major combat" in Afghanistan—mirroring President Bush's "mission accomplished" speech in Iraq—and emphasized a transition from combat to "stability, stabilization, and reconstruction." These developments—regime change, the establishment of political institutions, the declaration of an end to major combat, and the transition to multilateral security governance—define 2001–2003 as the critical founding stage of the war, setting the political and military trajectory for the two subsequent decades. Source: Council on Foreign Relations: U.S. War in Afghanistan Timeline and Council on Foreign Relations: Iraq War Timeline.

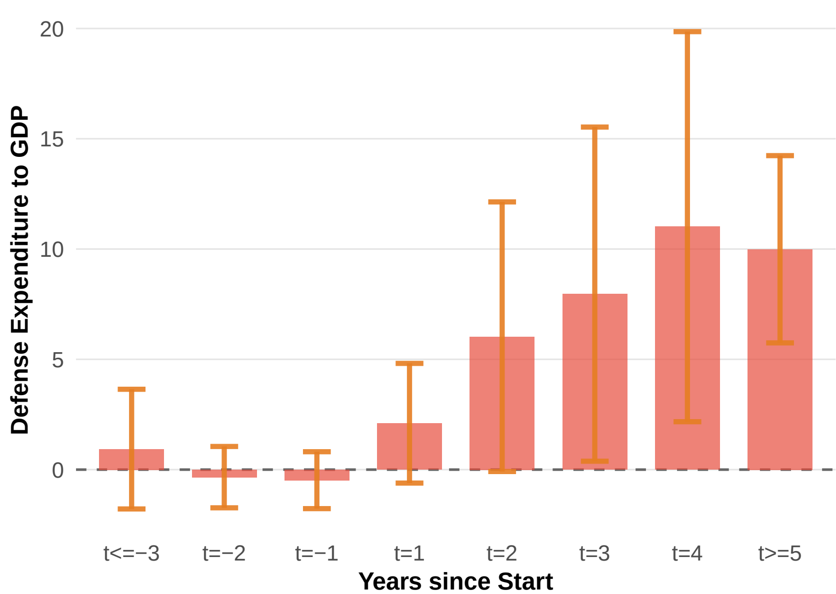
the war. We run the following regression:

$$def_{i,t} = \alpha_c + \gamma_{-4} 1_{\{K_{i,t} \leq -4\}} + \sum_{k=-3,-2,0,1,2,3} \gamma_k 1_{\{K_{i,t}=k\}} + \gamma_4 1_{\{K_{i,t} \geq 4\}} + \varepsilon_{i,t},$$

where $def_{i,t}$ is the defense spending in year t/GDP in year t ratio. We omit the dummy for the year $t-1$ to normalize the coefficients relative to this base year. We pool U.S. and U.K. wars.

Figure 2 plots the estimated coefficients γ_k along with their 95% confidence intervals. The results show a significant increase in the defense spending/GDP ratio during wartime. Table 2 reports the regression results. The defense spending/GDP ratio increases significantly starting from year 2 of the war, reaching a peak increase of 11.01% of GDP per annum in year 4 of the war. These substantial increases in defense spending during wars have important implications for government borrowing needs and bond returns, which we explore in subsequent sections.

Figure 2: Defense Spending/GDP around Wars



Notes: The figure plots the estimated coefficients from the regression of the defense spending/GDP ratio on event-time dummies around wars. The omitted category is the year before the war starts. The orange bars indicate two-standard-error bands based on heteroskedasticity-robust standard errors. The graph pools data from the U.S. and the U.K.

Table 2: Defense Spending/GDP around Wars

	Dependent variable: Defense Spending/GDP							
	$t \leq -3$	$t = -2$	$t = -1$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t \geq 5$
Coefficient	0.93	−0.34	−0.48	2.10	6.03*	7.96**	11.01**	9.99***
Std. Error	(1.36)	(0.70)	(0.64)	(1.36)	(3.06)	(3.79)	(4.42)	(2.12)
Num. obs.	185							
Num. groups: country	2							
R^2 (full model)	0.24							

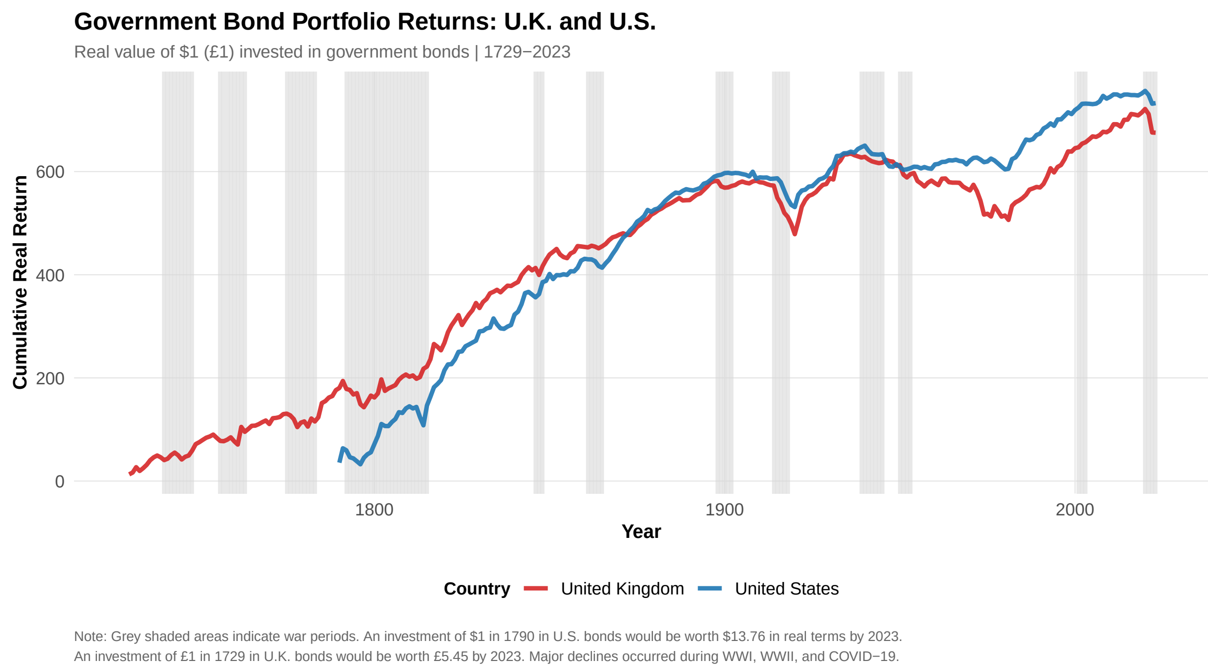
Notes: The table reports the regression results of the defense spending/GDP ratio on event-time dummies around wars. Heteroskedasticity-robust standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

3 The Government Cost of Funding in Wartime

We begin by examining the overall returns of government bond portfolios over the full sample period for which data are available. Figure 3 plots the cumulative log real returns on the central government bond portfolios in the U.K. and the federal government bond portfolio in the U.S. An initial investment of one pound in the U.K. government bond portfolio in 1729 would have grown to £858 in real terms by the end of 2023. Investing one dollar in the U.S. government bond portfolio in 1790 would yield $1,522 in real terms by the end of 2023.

WW-I, WW-II, and Covid-19 marked the largest market corrections in the U.S. and U.K. government bond markets. During WW-I and its aftermath, the real cumulative value of the U.K. government bond portfolio declined by 61% (1913–20), erasing the entire cumulative real return since 1870. U.S. investors experienced a similar decrease in the real value of their bond holdings. The real value of the U.S. bond portfolio declined by 45% (1913–20), erasing all of the real returns since 1870. WW-II marked another significant decline in the real value of bond portfolios in the U.S. and the U.K. The real value of the U.K. bond portfolio dropped by 10% from 1939 to 1945, and by another 4% from 1945 to 1950, and the real value of the U.S. bond portfolio dropped by 13% from 1939 to 1945, and by another 22% from 1945 to 1950. Viewed through the lens of the government bond market, Covid-19 looks quite similar to WW-I and WW-II. The real value of the U.K. bond

Figure 3: Cumulative Log Real Returns on the Bond Portfolio.



Notes: The plot shows the real value of $1 (£1) invested in the U.S. (U.K.) bond portfolio in 1790 (1729). U.S. sample runs from 1790 to 2023. U.K. sample runs from 1729 to 2023.

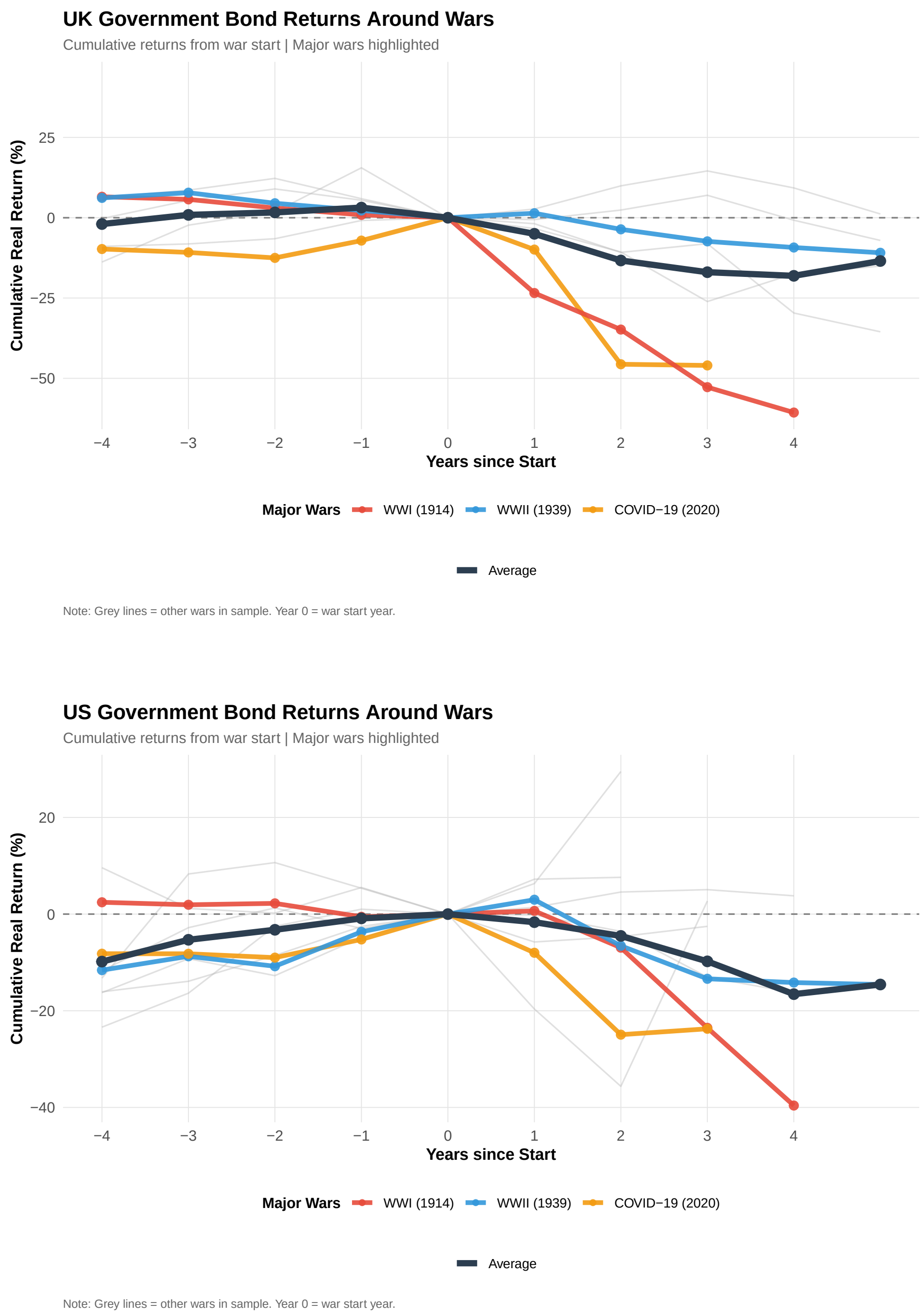
portfolio declined by 32% and the real value of the U.S. bond portfolio declined by 17% between 2019 and 2023.

3.1 Returns on the Government Bond Portfolio in Wartime

Next, we establish three empirical observations regarding the performance of government bonds around wars. We show that government bonds not only had negative returns during war years, they also underperformed relative to the stock market and GDP growth.

Figure 4 plots the cumulative log returns on the government bond portfolios of the U.K. (panel a) and the U.S. (panel b) during major war episodes. We use $t = 0$ to denote the calendar year in which the war began, and we end each line segment in the calendar year in which the war ended. Consistent with our observation above, wars are marked by large negative real returns on the government's debt portfolio in the U.S. and the U.K.

Figure 4: Real Returns on the Government Bond Portfolio around Wars



Notes: The top panel plots the log cumulative real return for the U.K. government bond portfolio and the bottom panel for the U.S. government bond portfolio, expressed in %. Each line segment denotes one major war episode, starting four years before the war until the end of the war. The solid red line denotes the average across the major war episodes.

We use an event-study approach to systematically study bond returns during wars. Let $R_{i,t}$ denote the cumulative log real bond return in country-war event i and year t. Let E_i denote the calendar year during which the war started, and let $K_{i,t} = t - E_i$ denote the relative time, i.e., the number of years between time t and the event year. By construction, $K_{i,t} = 0$ in the event year t. For each war, we include the five years before the war and all of the calendar years during the war. We run the following regression:

$$y_{i,t} = \alpha_c + \gamma_{-4} 1_{\{K_{i,t} \leq -4\}} + \sum_{k=-3,-2,0,1,2,3} \gamma_k 1_{\{K_{i,t}=k\}} + \gamma_4 1_{\{K_{i,t} \geq 4\}} + \varepsilon_{i,t}, \quad (1)$$

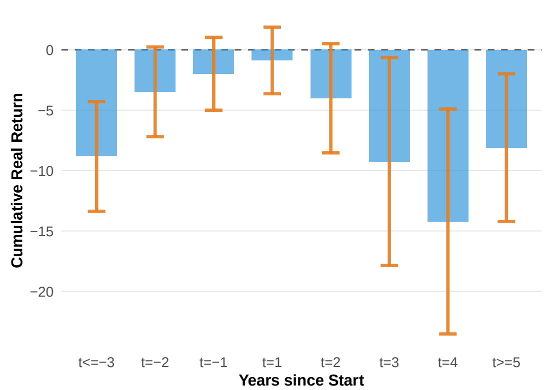
where $y_{i,t} = r_{i,t}$, the cumulative return on the government bond portfolio. We omit the dummy for the year $t-1$ to normalize the coefficients relative to this base year. We pool U.S. and U.K. wars. Panel (a) of Figure 5 reports the γ_k coefficient estimates which summarize the average cumulative real returns on the government bond portfolio. Starting in year 2 after the outbreak of the war, the government debt portfolio shows economically and statistically significant losses in real terms. Appendix Table A.3 reports the regression coefficients. The cumulative losses grow from 4% in year 2 to 14% in year 4.

We also report our main results using the robustness sample in Figure A.4. As discussed in Section 2.3, the robustness sample for the United States expands the war period to include the Iraq-Afghanistan wars from 2001 to 2011 and Bleeding Kansas (1854–1859), while the robustness sample for the United Kingdom includes two additional conflicts: the Boer War (1899–1902) and the Crimean War (1853–1856).

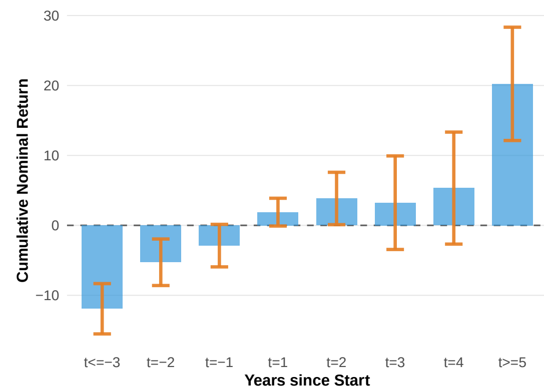
3.1.1 Surprise Inflation

Next, we investigate how much of the negative real returns during war episodes are due to high inflation. To that end, we repeat the analysis in equation (1) for cumulative *nominal* bond returns, i.e., the dependent variable is $y_{i,t} = r_{i,t} + \pi_{i,t}$ the real return plus inflation. Panel (b) of Figure 5 shows the coefficient estimates. Nominal bond returns are positive in the run-up to the wars, and remain positive after wars. The entire negative effect on real bond returns is due to high inflation. Panel (c) of Figure 5 reports the response of cumulative inflation, which increases steadily after the war.

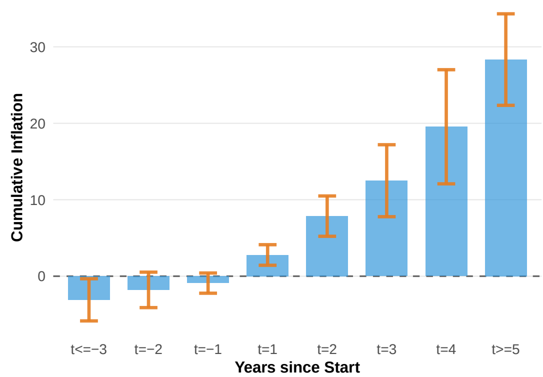
Figure 5: Bond Cumulative Returns during Wars



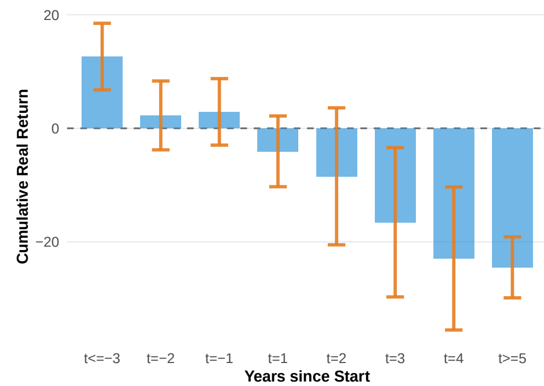
(a) Real Bond Returns



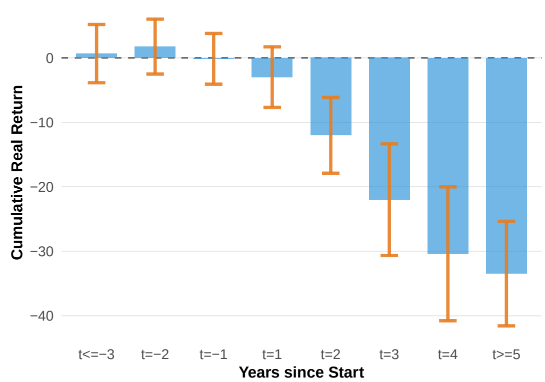
(b) Nominal Bond Returns



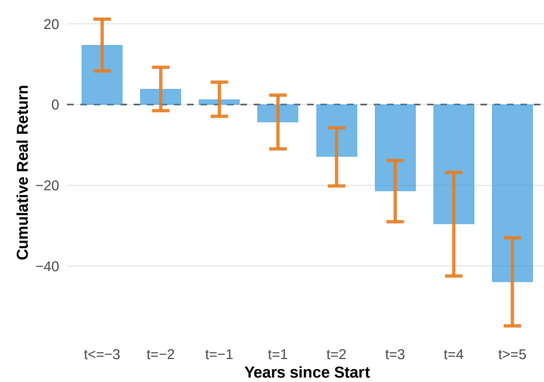
(c) Inflation



(d) Bond-Minus-Stock Returns



(e) Bond-Minus-Growth Returns



(f) Bond-Minus-Housing Returns

Notes: The figure plots the regression coefficients in the event study regressions (1), where the dependent variable $y_{i,t}$ is the log cumulative real return on the government bond portfolio in panel (a), the log cumulative nominal return on the government bond portfolio in panel (b), the log cumulative inflation in panel (c), the log cumulative return on the bond-minus-stock portfolio in panel (d), the log cumulative bond return minus GDP growth in panel (e), and the log cumulative return on the bond-minus-housing portfolio in panel (f). The horizontal axes denote the years since the start of the war. The orange bars indicate two-standard-error bands based on heteroskedasticity-robust standard errors.

Column (2) of Table A.3 reports the regression coefficients of equation (1) where the dependent variable is the cumulative nominal government bond returns. Cumulative nominal bond returns show a 4% gain in year 2 and 5% in year 4, compared to real returns of −4% and −14% respectively. The difference is inflation. Nominal yields decline after the start of the war, even though inflation is increasing. That is the hallmark of financial repression. Inflation erodes real returns by 20% over 4 years. Governments finance wars by inflating away the debt.

Our sample covers a range of different monetary regimes. The U.K. adopted a de facto gold standard in 1717. However, during the Napoleonic wars, the Bank of England suspended specie payments in 1797 and authorized fiat currency. The U.K. only returned to the gold standard in 1821. The U.K. went off the gold standard again at the start of WWI. The U.K. briefly returned to the gold standard in 1925, but that only lasted until 1931. Hence, the U.K. was off the gold standard during the major wars.

The U.S. adopted a bimetallic system in 1792, and switched to the gold standard in 1834. The U.S. suspended specie payments in 1861 at the start of the Civil War. This lasted until 1879. The U.S. did not formally suspend the gold standard during WWI, but it stopped gold exports during WWI. Roosevelt abandoned the gold standard in 1933. As a result, the U.S. was also off the gold standard during the largest wars in its history.[7]

3.1.2 Financial Repression

Nominal bond returns after the start of the war are positive, as the government tries to lower the yields on new issuances, even though inflation is increasing. This is the footprint of financial repression. U.S. wartime history is replete with examples of financial repression. The U.S. federal government and the Federal Reserve Bank often resorted to financial repression of one sort or another, especially in wartime to keep the war effort funded without fully monetizing deficits. The U.S. government typically would not increase tax revenue as much as spending during wars, resorting to debt issuance to finance the deficits.

[7] In flexible exchange rate regimes, bond devaluation can also take the form of currency depreciation (Jiang, 2022). In currency unions, deficits in member countries also lower bond value by driving down bond convenience yields (Jiang, Lustig, Van Nieuwerburgh, and Xiaolan, 2025).

During the Civil War, in 1862, Congress passed the Legal Tender Act which allowed the Treasury to issue Treasury Notes that were legal tender and hence had to be accepted as payment. These greenbacks could be used to pay back debts. The Treasury Notes were not backed by gold or silver, did not pay interest, and did not have a maturity date. All of these provisions were unusual in those days. The U.S. federal government was issuing paper currency for the first time. In 1863, Congress passed the National Banking Act which reinserted the U.S. federal government into the banking system. Banks that were chartered as National Banks were allowed to issue uniform banknotes, but these had to be backed by Treasury bonds. These notes were identical in all states, much like the notes issued by the Bank of England. The Act also imposed a 2% tax on notes issued by the states in order to discourage the states' issuance. The National Banking scheme was designed to encourage investors to buy and hold interest-bearing bonds, not as inflationary as paper currency (Lowenstein, 2022).

During WW-I, the U.S. Treasury chose not to force banks to buy its bonds. Instead, the Treasury relied on the Federal Reserve to help finance the war effort. The Federal Reserve lent large amounts to the banks through the discount window by discounting loans made by the banks with Liberty Loans as collateral. The Federal Reserve bank also purchased certificates of indebtedness directly from the Treasury. In addition, the Federal Reserve Bank lent at lower rates to banks that purchased the Treasury's certificates of indebtedness (Hall, 2019).

During WW-II, the Federal Reserve bank resorted to what we now call Yield Curve Control. Starting in 1942, the Fed capped the rate on Treasury Bills at 3/8 percent and the rate on bonds at 2.5%. To maintain this cap, the Federal Reserve was forced to buy T-bills and Bonds, thus increasing the money supply. Between 1944 and 1948, the Fed held between 40% and 90% of outstanding Treasury bills. In order to control inflation, the government resorted to price controls. This arrangement lasted until 1951. Acalin and Ball (2023) conclude that financial repression played a substantial role in reducing the debt/GDP ratio of WWII.

During COVID, the Fed resorted to large scale asset purchases of Treasurys, allowing the consolidated government to fund by itself issuing non-marketable debt (bank reserves). Over the course of the 2020–2021 pandemic, the Fed has purchased Treasurys worth 14% of 2020 GDP or equivalently 55% of total Treasury issuance. Excluding T-bills, the Fed had absorbed 99% of Bond and Note issuance between 2020Q1 and 2021Q1, regularly purchasing much more than what was being issued by the Treasury. At the longer end of the maturity spectrum, the Treasury has not tested the bond market during the pandemic, in spite of government deficits that are unprecedented in size in post-war history.

There is similar evidence for the U.K. During WW-I, the Bank of England significantly increased its holdings of government securities from 13% to 33% without full disclosure by classifying these as "Other Securities" (Owens and Todman, 2017). The U.K. Treasury even threatened compulsory purchases of Treasury securities, and it imposed an additional income tax on non-Treasury securities. The U.K. Treasury also prohibited the issuance of private securities without clearance from the U.K. Treasury (Higgins, 1949). Finally, the U.K. also resorted to intergovernmental loans from the U.S. to fund the war effort. During the interbellum, the U.K. ultimately defaulted on these intergovernmental loans from the U.S.

3.2 Safe vs. Risky Assets?

Not only do government bond returns post poor real returns in wartime, they even underperform risky assets such as stocks and residential real estate.

Figure A.2 plots the cumulative log returns of the government bond portfolio minus the cumulative log returns of the national equity portfolio during periods of war. With the exception of a few wars early in the sample, almost all wars resulted in a greater decline in the real value of the bond portfolio than that of the stock portfolio. This result challenges the conventional wisdom that government bonds are safe assets whereas stocks are risky assets. While government bonds may exhibit hedging properties during economic recessions, they appear to be risky assets during wars. Bonds appear to be more sensitive to large shocks to defense spending than stocks.

To formalize this evidence, we repeat the event study, replacing the dependent variable in (1) by the cumulative real return differential between the government bond and the national equity portfolios: $y_{i,t} = r_{i,t} - r_{i,t}^{stock}$. Panel (d) of Figure 5 confirms that the government bond portfolio underperforms the equity market by an economically and statistically significant margin. The coefficient estimates, reported in column (2) of Table A.3, indicate that the cumulative return differential grows to −17% by year 3, −23% by year 4, and −24% for $t > 4$.

Housing is a key component of households' portfolios, and exhibits pronounced procyclicality and substantial volatility (Case and Shiller, 1989; Davis and Van Nieuwerburgh, 2015; Piazzesi and Schneider, 2016). Data sources for housing returns are discussed in Appendix B. Comparing cumulative real returns between the government bond portfolio and housing, $y_{i,t} = r_{i,t} - r_{i,t}^{h}$, column (5) of Table A.3 shows that the government bond portfolio underperforms housing by 4% in the year of the outbreak. This gap then widens steadily, with cumulative underperformance exceeding 30% by year 4 and 44% for $t > 4$.[8] The evidence from stock and housing markets leads us to conclude that the underperformance of government bonds is widespread.

3.3 $r - g$ in Wartime

Over the entire sample, bond returns (2.99%) in the U.S. are lower than GDP growth (3.78%), which puts the U.S. in the region where steady-state deficits can be sustained. Figure 1 plots the time series of real bond returns minus real GDP growth for the U.K. and the U.S. We take a rolling five-year average of the difference between bond returns and GDP growth to smooth out high-frequency fluctuations. During major wars (denoted by gray shades), bond returns tend to fall significantly short of GDP growth, especially during the largest wars. During peacetime, this rarely happens, with the exception of the U.K. post-war period between 1945 and 1980 when the U.K. had interest rate controls in place to deal with the enormous debt/GDP ratio at the end of WW-II. In addition, the U.K. had imposed capital controls and directed lending. The U.S. also imposed a ceiling on interest rates (regulation Q).

[8]Because housing return data are not available for the WW-II period, this regression contains fewer observations.

Table 3 reports the average difference between real bond returns and real GDP growth during wartime and peacetime. In both the U.K. and the U.S., bond returns exceed GDP growth during peacetime, with an average excess return of 1.42% in the U.K. and 0.44% in the U.S. However, during wartime, bond returns fall short of GDP growth by an average of −2.78% in the U.K. and −6.69% in the U.S. The difference between wartime and peacetime averages is economically significant, amounting to −4.20% for the U.K. and −7.12% for the U.S. Steady-state deficits may be sustainable but only if governments resort to hidden taxation in the form of surprise inflation and financial repression.

Economic output tends to contract sharply during wars. We compare the returns of the portfolio of all outstanding government bonds with the rate of real GDP growth. We refer to the difference as r minus g. Figure A.3 shows the cumulative $r - g$ over the entire sample period for the U.K. and the U.S. Cumulative $r - g$ decreased significantly during WW-I, WW-II, and the war on Covid-19.

To formalize this evidence, we repeat the event study, replacing the dependent variable in (1) by the cumulative real return differential between the government bond portfolio and GDP growth: $y_{i,t} = r_{i,t} - g_{i,t}$. Panel (e) of Figure 5 shows an economically and statistically significant negative effect on cumulative $r - g$. The coefficient estimates, reported in column (4) of Table A.3, indicate that the cumulative return differential is −12% in year 2, growing to −30% by year 4 and −33% for $t > 4$. These numbers imply that governments manage to lower the debt/GDP ratio by 30% or more over the course of a long war through a combination of inflation and financial repression compared to a benchmark without surprise inflation and financial repression.

Table 3: Bond Returns Minus GDP Growth

$r - g$	No War	War	Difference
U.K.	1.42	−2.78	−4.20
U.S.	0.44	−6.69	−7.12

Notes: The table reports the average difference between per annum real bond returns and real GDP growth in pps. during wartime and peacetime. The U.K. sample covers 1729–2023, and the U.S. sample covers 1790–2023.

4 The Government Cost of Funding in Financial Crises

In the final section, we contrast the results for bond returns during wartime with the behavior of government bond returns during financial crises. We follow Jordà, Schularick, and Taylor (2017) to identify financial crises over our sample period. In the U.S., financial crises include the Panic of 1873, the Panic of 1893, the Panic of 1907, the Great Depression in the early 1930s, the Savings and Loan Crisis of the mid-1980s, and the Global Financial Crisis of 2007–09. For the U.K., financial crises include the Baring Crisis of 1890, the Secondary Banking Crisis in the mid 1970s, Exchange Rate Mechanism (ERM) Crisis in the early 1990s, and the Global Financial Crisis of 2007–09.

Figure 6 reports the results of an event study of cumulative bond returns, plotting the coefficient estimates of (1), but where the years are relative to the onset of financial crises rather than wars. We find that cumulative real bond returns are positive after financial crises (12%, two or more years after the onset), higher than stock returns (by 16%, two or more years after the onset), and higher than GDP growth rates (by 13%, two or more years after the onset). Table A.4 shows that the outperformance of bonds is statistically significant two or more years after the onset. These results contrast sharply with our findings for wars, when government bonds underperform equities and growth rates significantly.

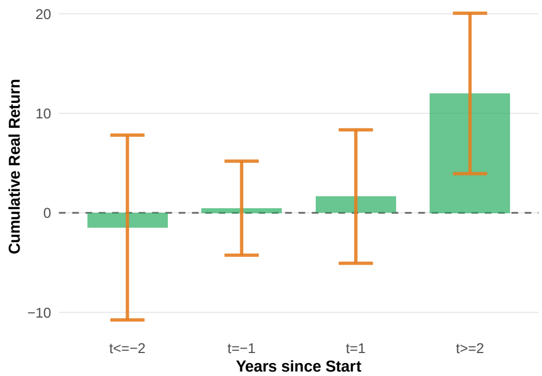
This contrast highlights the unique fiscal pressures associated with wars. Table 4 reports the average government surplus/GDP ratio during wartime and peacetime, and

Table 4: Government Surpluses

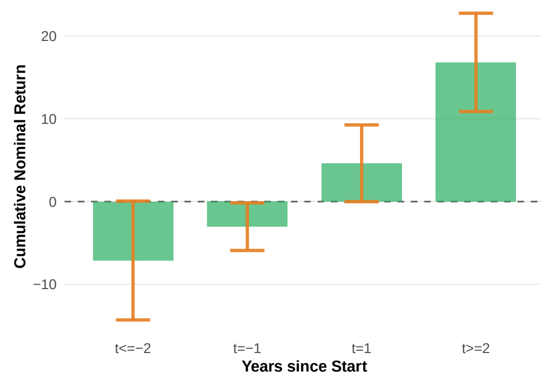
s	No War	War	Difference
U.K.	3.24	−5.22	−8.46
U.S.	0.44	−2.53	−2.98
s	No Financial Crisis	Financial Crisis	Difference
U.K.	0.19	−0.86	−1.05
U.S.	−0.22	−0.47	−0.25

Notes: The table reports the average government surplus/GDP ratio in pps. during wartime and peacetime, and during financial crises and non-crisis periods. For the war sample, the U.K. sample covers 1729–2023, and the U.S. sample covers 1790–2023. For the crisis sample, the U.K. sample covers 1870–2023, and the U.S. sample covers 1870–2023; each crisis period starts in the year of the identified financial crisis and lasts for three years.

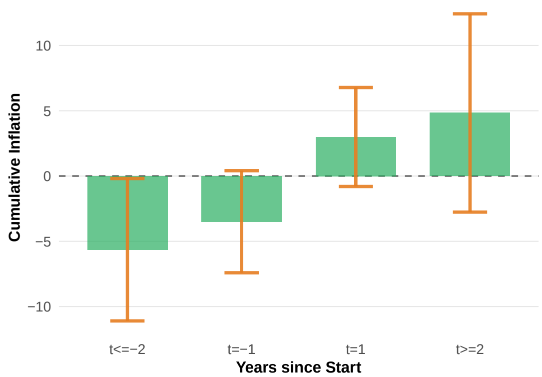
Figure 6: Bond Cumulative Returns during Financial Crises



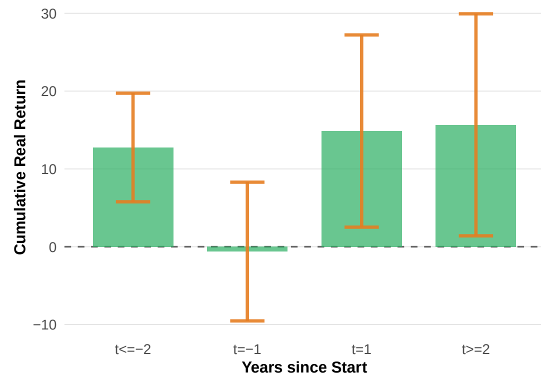
(a) Real Bond Returns



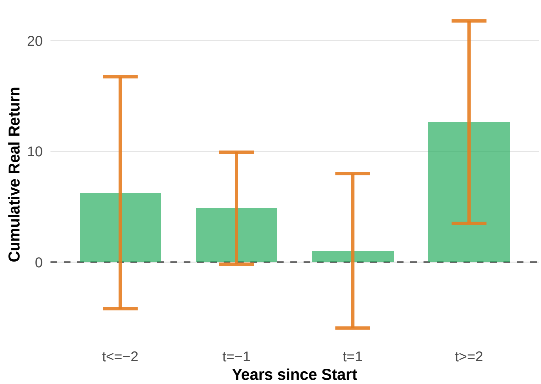
(b) Nominal Bond Returns



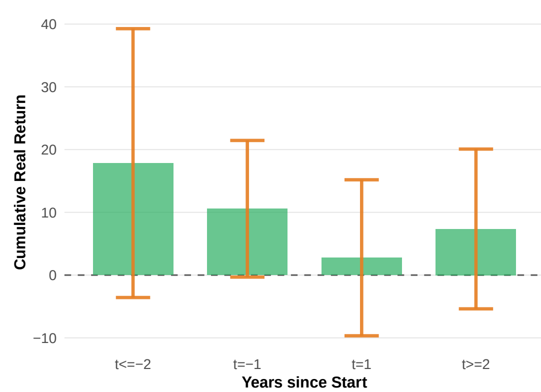
(c) Inflation



(d) Bond-Minus-Stock Returns



(e) Bond-Minus-Growth Returns



(f) Bond-Minus-Housing Returns

Notes: The figure plots the regression coefficients in the event study regressions (1), but replaces the event of war with the onset of financial crises. The dependent variable $y_{i,t}$ is the log cumulative real return on the government bond portfolio in panel (a), the log cumulative nominal return on the government bond portfolio in panel (b), the log cumulative inflation in panel (c), the log cumulative return on the bond-minus-stock portfolio in panel (d), the log cumulative bond return minus GDP growth in panel (e), and the log cumulative return on the bond-minus-housing portfolio in panel (f). The horizontal axes denote the years since the start of the financial crisis. The orange bars indicate two-standard-error bands based on heteroskedasticity-robust standard errors.

during financial crises and non-crisis periods. During wars, the U.S. (U.K.) experiences large government deficits which are 2.98% (8.46%) of GDP per annum higher than during peacetime. During financial crises, government deficits also rise compared to non-crisis periods, but the magnitude of the increase is much smaller: 0.25% in the U.S. and 1.05% in the U.K. The magnitude of fiscal pressures during wars compared to financial crises is therefore much higher. The data show that bondholders are required to bear a substantial share of the fiscal burden as governments ramp up defense spending. In contrast, taxpayers rather than bondholders bear the fiscal costs of financial crises.

5 Conclusion

The U.S. and the U.K. have managed to bring down high government debt/GDP ratios resulting from wars without resorting to explicit default, but rather through a combination of surprise inflation and financial repression. Contrary to the conventional wisdom that government bonds are safe assets, government bonds severely underperform in wartime, not only in absolute terms, but also relative to equities, housing, and GDP growth rates. This result contrasts with the returns to government bonds during financial crises, when bonds tend to outperform stocks. Wars and pandemics are different because fiscal spending is much higher and governments force bondholders to bear a substantial share of that fiscal burden through a combination of financial repression and surprise inflation.

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Appendix

A Additional Results

Table A.1: U.K. Defense Spending During Major Wars

War Name	Start Year	End Year	$\frac{Defense}{GDP}$	$\Delta\frac{Defense}{GDP}$	$\frac{\sum Defense}{GDP_{t-1}}$
WWI	1914	1918	41.57	35.60	328.87
WWII	1939	1945	42.01	34.77	484.76
French–Napoleonic Revolutionary Wars	1792	1815	9.59	6.46	466.04
Seven Years' War	1756	1763	9.75	5.85	89.53
American Revolution	1775	1783	7.71	4.94	80.36
War of the Spanish Succession	1701	1714	6.33	4.68	85.45
War of the Austrian Succession	1740	1748	7.00	4.13	67.66
South African War	1899	1902	5.34	2.69	22.27
War of 1812	1812	1815	12.12	2.30	50.92
Crimean War	1853	1856	3.38	1.27	16.06
Yamasee War	1715	1716	3.32	0.71	6.52
Falkland Islands War	1982	1982	4.50	0.17	4.95
Rohilla War	1774	1774	2.78	0.07	2.79
Iraq War	2003	2011	2.27	0.04	25.47
Persian Gulf War	1990	1991	3.24	−0.09	7.17
Anglo–Zulu War	1879	1879	2.06	−0.09	2.04
Naning War	1831	1832	2.86	−0.13	5.63
Second Carnatic War	1749	1754	3.87	−4.66	23.75
Third Maratha War	1817	1818	4.22	−5.92	8.79
Greek Civil War	1944	1949	21.70	−28.42	132.93
Russian Civil War	1918	1920	15.90	−36.25	56.25
Covid	2020	2023	—	—	19.27

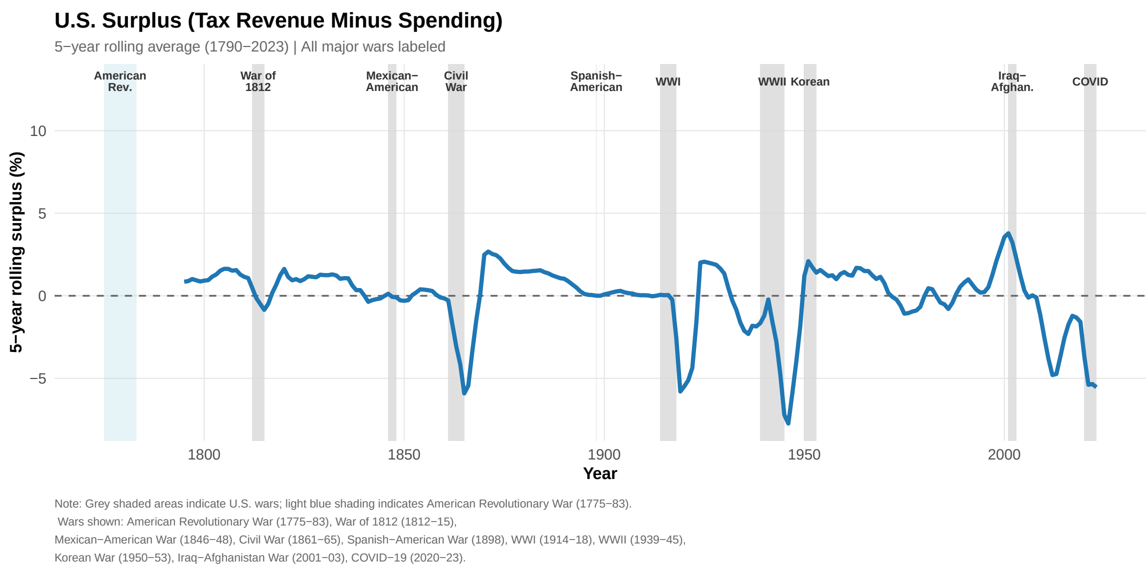
Notes: The table reports the average ratio of annual defense spending to GDP for major wars involving the United Kingdom between 1729 and 2023. Defense/GDP is the average percentage of GDP spent on defense per annum during major wars. Δ Defense/GDP is the difference between the average defense-spending-to-GDP ratio during a war and the ratio in the year immediately preceding the war. $\frac{\sum Defense}{GDP_{t-1}}$ denotes cumulative defense spending over the entire course of the war, normalized by GDP in the year prior to the war. The overall COVID-19 expense is measured as reported fiscal measures in response to the COVID-19 pandemic, expressed as a fraction of GDP. The Covid expense data is sourced from the IMF Database of Fiscal Policy Responses to COVID-19. All values are expressed in percentage points. Defense expenditure data are sourced from the U.K. Office for Budget Responsibility's Historical Public Finances database.

Table A.2: U.S. Defense Spending During Major Wars

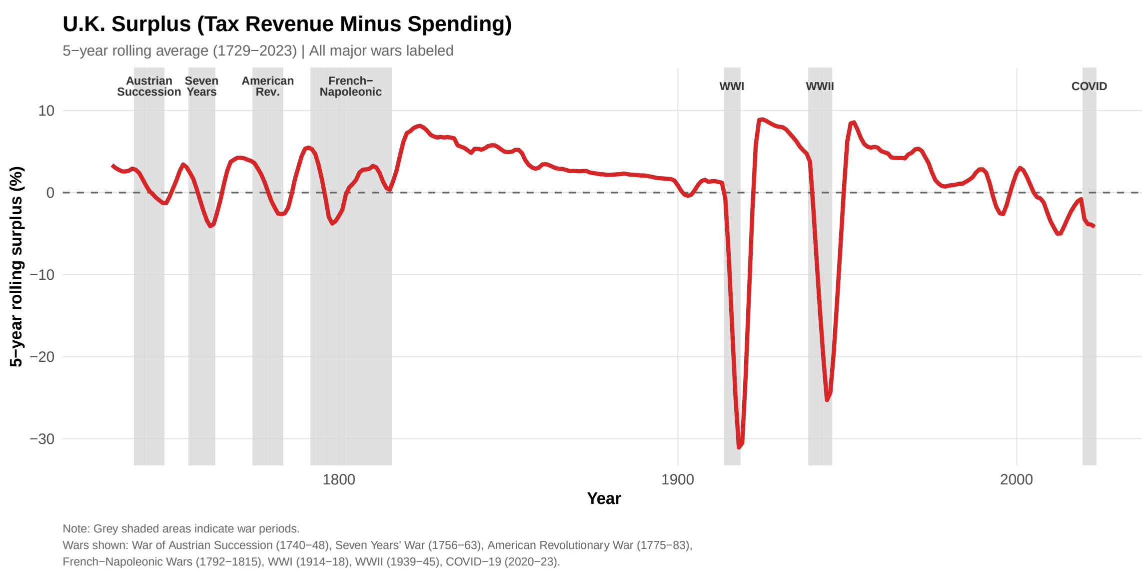
War Name	Start Year	End Year	$\frac{Defense}{GDP}$	$\Delta\frac{Defense}{GDP}$	$\frac{\sum Defense}{GDP_{t-1}}$
WWII	1939	1945	17.10	15.93	283.38
Russian Civil War	1918	1920	10.23	9.31	40.61
Civil War	1861	1865	7.33	6.65	69.98
Korean War	1950	1953	7.86	3.68	41.86
War of 1812	1812	1815	2.65	2.65	13.04
WWI	1914	1918	2.39	1.75	21.13
Mexican–American War	1846	1848	1.43	0.89	5.38
Spanish–Philippine–American War	1898	1902	0.96	0.47	6.13
Iraq–Afghanistan War	2001	2003	3.20	0.33	10.32
Bleeding Kansas	1854	1859	0.77	0.17	5.74
Red River Indian War	1874	1875	0.77	−0.02	1.47
Vietnam War	1964	1975	6.94	−1.43	138.30
First Barbary War	1801	1805	0.00	−2.08	0.00
Greek Civil War	1944	1949	16.83	−13.14	115.16
Covid	2020	2023	–	–	25.50

Notes: The table reports the average ratio of annual defense spending to GDP for major wars involving the United States between 1730 and 2023. Defense/GDP is the average percentage of GDP spent on defense per annum during major wars. ΔDefense/GDP is the difference between the average defense-spending-to-GDP ratio during a war and the ratio in the year immediately preceding the war. $\frac{\sum Defense}{GDP_{t-1}}$ denotes cumulative defense spending over the entire course of the war, normalized by GDP in the year prior to the war. All values are expressed in percentage points. The overall COVID-19 expense is measured as reported fiscal measures in response to the COVID-19 pandemic, expressed as a fraction of GDP. The Covid expense data is sourced from the IMF Database of Fiscal Policy Responses to COVID-19. The time series of U.S. federal defense expenditure is from `usgovernmentspending.com` and the nominal GDP data is from Johnston and Williamson (2022) `measuringworth.com`.

Figure A.1: Government Surpluses in the U.S. and the U.K.



(a) U.S. Government Surpluses



(b) U.K. Government Surpluses

Notes: Each panel reports the primary surplus-to-GDP ratio. Primary surpluses are defined as government revenue minus government spending before interest payments. Shaded areas correspond to major wars in each country's history.

Table A.3: Average Cumulative Returns during Wars: Event Study

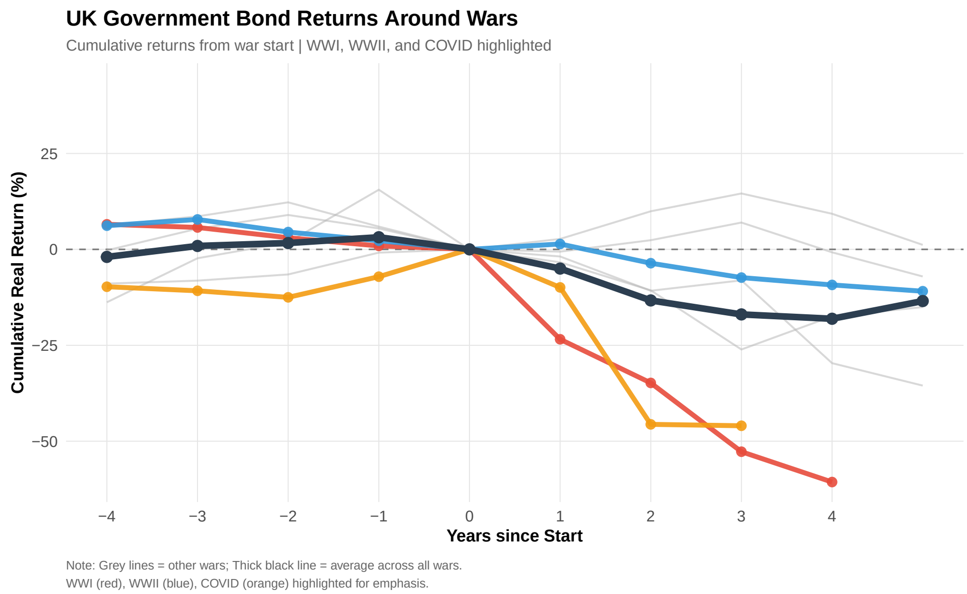
	(1) Bond (Real)	(2) Bond (Nominal)	(3) Bond - Stock	(4) Bond - Growth	(5) Bond - Housing
t<=-3	-0.09^{***}	-0.12^{***}	0.13^{***}	0.01	0.15^{***}
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)
t=-2	-0.03^{*}	-0.05^{***}	0.02	0.02	0.04
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)
t=-1	-0.02	-0.03^{*}	0.03	-0.00	0.01
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
t=1	-0.01	0.02^{*}	-0.04	-0.03	-0.04
	(0.01)	(0.01)	(0.03)	(0.02)	(0.03)
t=2	-0.04^{*}	0.04^{**}	-0.08	-0.12^{***}	-0.13^{***}
	(0.02)	(0.02)	(0.06)	(0.03)	(0.04)
t=3	-0.09^{**}	0.03	-0.17^{**}	-0.22^{***}	-0.21^{***}
	(0.04)	(0.03)	(0.07)	(0.04)	(0.04)
t=4	-0.14^{***}	0.05	-0.23^{***}	-0.30^{***}	-0.30^{***}
	(0.05)	(0.04)	(0.06)	(0.05)	(0.06)
t>=5	-0.08^{***}	0.20^{***}	-0.24^{***}	-0.33^{***}	-0.44^{***}
	(0.03)	(0.04)	(0.03)	(0.04)	(0.05)
Num. obs.	186	186	186	186	77
Num. groups: country	2	2	2	2	2
R^2 (full model)	0.09	0.32	0.40	0.48	0.77

Notes: This table reports the results of the following regression:

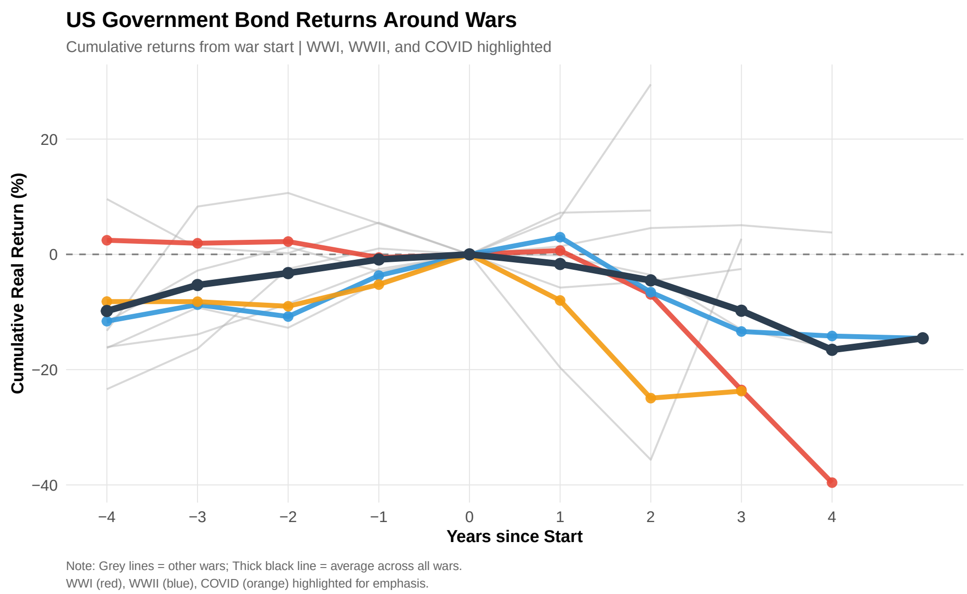
$$y_{i,t} = \alpha_c + \gamma_{-3} 1_{\{K_{i,t} \leq -3\}} + \sum_{k=-2,0,1,2,3,4} \gamma_k 1_{\{K_{i,t}=k\}} + \gamma_5 1_{\{K_{i,t} \geq 5\}} + \varepsilon_{i,t}.$$

The event in this regression is defined as major wars defined in Section 2.2. Column (1) reports estimates from regressions of the cumulative log real bond return on event dummies. Column (2) reports estimates using nominal bond return. Column (3) presents results for the cumulative return differential between the government bond portfolio and the national stock market index. Column (4) presents results for the cumulative differential between the government bond portfolio and GDP growth. Column (5) presents results for the cumulative differential between the government bond portfolio and housing return. Heteroskedasticity-robust standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Figure A.2: Cumulative Bond-Minus-Stock Returns around Wars.



(a) U.K. bond returns minus stock returns around wars



(b) U.S. bond returns minus stock returns around wars

Notes: Each panel plots the log cumulative returns on the government bond portfolio minus the log cumulative returns on the national equity portfolio from four years before the start until the end of each major war. Panel (a) is for the U.K. and panel (b) for the U.S.

Table A.4: Average Cumulative Returns during Recessions: Event Study

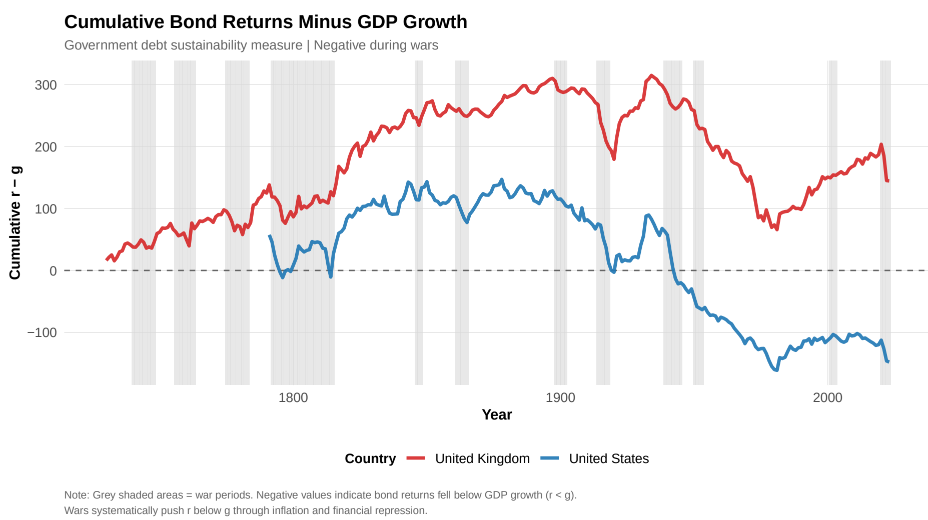
	(1) Bond (Real)	(2) Bond (Nominal)	(3) Bond - Stock	(4) Bond - Growth	(5) Bond - Housing
t<=-2	-0.01	-0.07^{*}	0.13^{***}	0.06	0.18
	(0.05)	(0.04)	(0.03)	(0.05)	(0.11)
t=-1	0.00	-0.03^{**}	-0.01	0.05^{*}	0.11^{*}
	(0.02)	(0.01)	(0.04)	(0.03)	(0.05)
t=1	0.02	0.05^{*}	0.15^{**}	0.01	0.03
	(0.03)	(0.02)	(0.06)	(0.03)	(0.06)
t>=2	0.12^{***}	0.17^{***}	0.16^{**}	0.13^{***}	0.07
	(0.04)	(0.03)	(0.07)	(0.05)	(0.06)
Num. obs.	60	60	60	60	47
Num. groups: country	2	2	2	2	2
R^2 (full model)	0.18	0.52	0.14	0.12	0.10

Notes: This table reports the results of the following regression:

$$y_{i,t} = \alpha_c + \gamma_{-2}1_{\{K_{i,t} \leq -2\}} + \sum_{k=0,1} \gamma_k 1_{\{K_{i,t}=k\}} + \gamma_2 1_{\{K_{i,t} \geq 2\}} + \varepsilon_{i,t}.$$

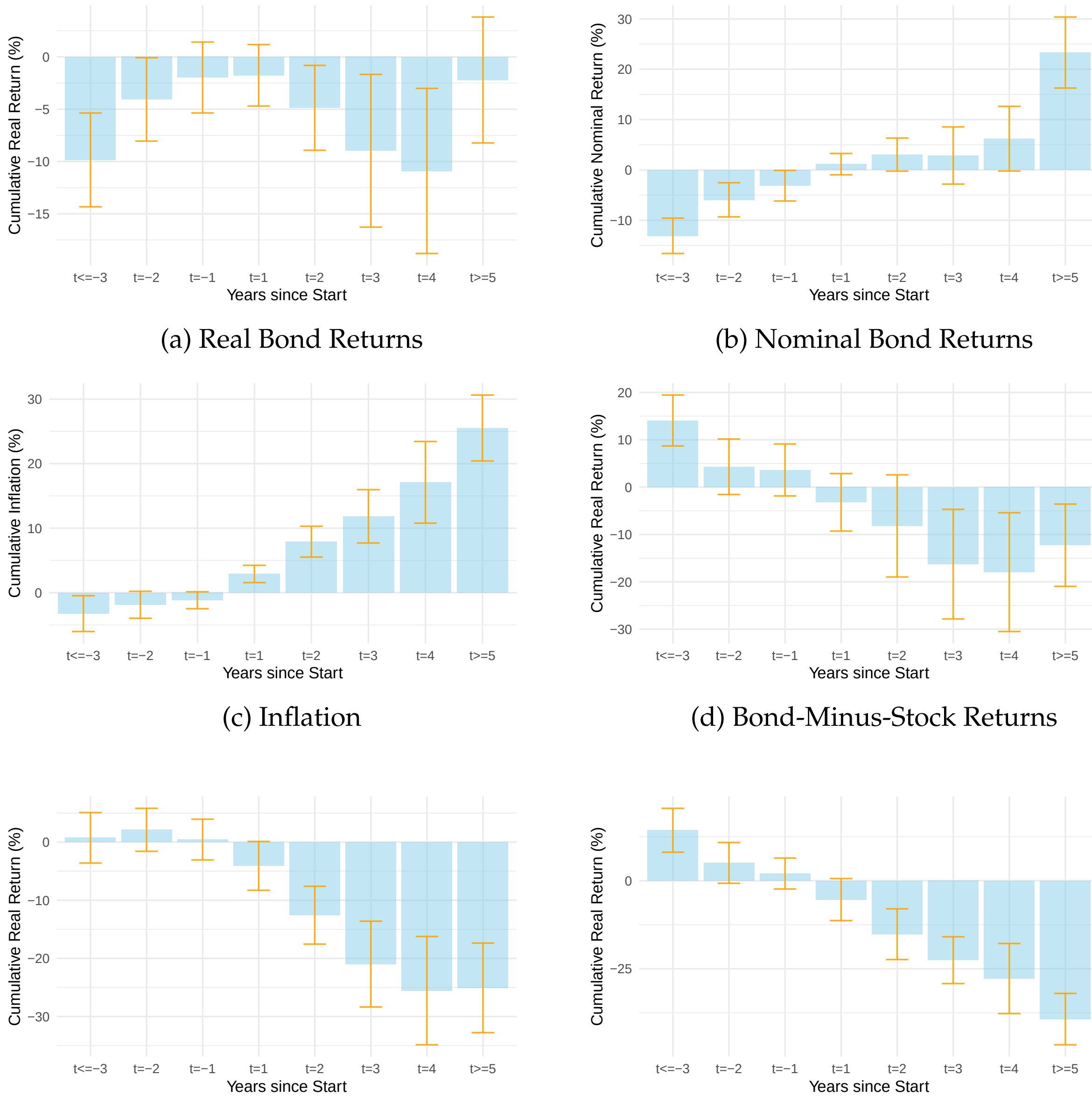
The event in this regression is defined as financial crisis identified in Jordà, Schularick, and Taylor (2017). Column (1) reports estimates from regressions of the cumulative log real bond return on event dummies. Column (2) reports estimates using nominal bond return. Column (3) presents results for the cumulative return differential between the government bond portfolio and the national stock market index. Column (4) presents results for the cumulative differential between the government bond portfolio and GDP growth. Column (5) presents results for the cumulative differential between the government bond portfolio and housing return. Heteroskedasticity-robust standard errors are reported in parentheses.

Figure A.3: Cumulative Bond Return Minus Growth



Notes: The plot shows the cumulative real bond returns minus cumulative real growth for the entire sample. U.S. sample period is from 1790 to 2022. U.K. sample period is from 1729 to 2023.

Figure A.4: Average Cumulative Returns during Wars, Robustness Sample



(a) Real Bond Returns

(b) Nominal Bond Returns

(c) Inflation

(d) Bond-Minus-Stock Returns

(e) Bond-Minus-Growth Returns

(f) Bond-Minus-Housing Returns

Notes: The figure plots the regression coefficients using the robust sample in the event study regressions (1), where the dependent variable $y_{i,t}$ is the log cumulative real return on the government bond portfolio in panel (a), the log cumulative nominal return on the government bond portfolio in panel (b), the log cumulative inflation in panel (c), the log cumulative return on the bond-minus-stock portfolio in panel (d), the log cumulative bond return minus GDP growth in panel (e), and the log cumulative return on the bond-minus-housing portfolio in panel (f). The horizontal axes denote the years since the start of the war. The orange bars indicate two-standard-error bands based on heteroskedasticity-robust standard errors. The robustness sample for the United States expands the war period to include the Iraq-Afghanistan wars from 2001 to 2011, while the robustness sample for the United Kingdom includes two additional conflicts: the Boer War (1899–1902) and the Crimean War (1853–1856).

B Data Appendix

This appendix provides detailed descriptions of the construction and sources of the macroeconomic and return time series used in the analysis for both the United States and the United Kingdom.

B.1 U.S. Data

- **Inflation**: For the period 1790 to 2021, U.S. inflation is obtained from the Global Financial Database (GFD) series `CPUSAM`. For the years 2022 and 2023, we use the Consumer Price Index for All Urban Consumers: All Items in U.S. City Average (`CPIAUCSL`), provided by the Bureau of Labor Statistics via FRED (`https://fred.stlouisfed.org/series/CPIAUCSL`).

- **Real GDP Growth**: From 1790 to 2020, real GDP growth is based on data from Johnston and Williamson (2022), specifically the log difference of real GDP measured in millions of dollars. For 2021 to 2023, real GDP growth is calculated using data from NIPA Table 1.1.5, deflated by the GDP deflator from NIPA Table 1.1.4.

- **Nominal Government Bond Return**: Nominal returns on government bonds from 1790 to 2020 are taken from the Sargent-Hall Marketable Data Historical Sample (Hall, Payne, and Sargent, 2018). For 2021 to 2023, we use the CRSP Treasury Monthly database and calculate the total principal payments, new issuance, coupon payments, and market value of outstanding government bond by aggregating the issuance-level data. We can compute the holding-period return of the government bond portfolio using $\frac{\text{Market Value}_t + (\text{Principal \& Coupon payments})_t - \text{New Issuance}_t}{\text{Market Value}_{t-1}}$.

- **Nominal Stock Return**: For 1792 to 2020, stock returns are computed using data on price growth and the price-dividend (PD) ratio from the Global Financial Database. For 2021 to 2023, stock returns are calculated as the growth rate of the S&P 500 Total Return Index (`SPXTRD`) from GFD.

- **Price Growth (Stocks)**: The stock price growth from 1792 to 2020 is taken from the

GFD series GFUS100MPM, which tracks the 100-share U.S. stock index.

- **PD Ratio (Stocks)**: For the period 1791 to 1928, the PD ratio is calculated as the logarithm of the inverse of the GFD series SYUSAYM (S&P 500 Monthly Dividend Yield), with the inverse value scaled by a factor of 100 and using the end-of-year observation. From 1929 to 2020, the PD ratio is constructed using CRSP stock file data accessed through WRDS.

- **Debt/GDP Ratio**: From 1791 to 2020, the Debt/GDP ratio is the market value of marketable debt from Hall, Payne, Sargent, and Szőke (2018) divided by GDP from Global Financial Database (Series GDPUSA). We extend the sample to 2023 using the CRSP Treasury Monthly Database by aggregating the market value of all outstanding government bonds and then dividing by nominal GDP from NIPA Table 1.1.5.

- **Tax Revenue and Government Spending**
  - Tax Revenue: For 1791–1929, tax revenue is calculated as the ratio of Net Ordinary Receipts from Hall and Sargent (2022) to Nominal GDP (in millions of dollars) from Johnston and Williamson (2022). For 1929–2023, it is computed as NIPA Table 3.2 (Line 1, updated January 22, 2026) divided by NIPA Table 1.1.5 (Line 1, updated January 22, 2026).
  - Government Spending: For 1791–1929, tax revenue is calculated as the ratio of Net Ordinary Expend from Hall and Sargent (2022) to Nominal GDP (in millions of dollars) from Johnston and Williamson (2022). For 1929–2023, it is computed as NIPA Table 3.2 (Line 24, updated January 22, 2026) minus interest payment (Line 33 - Line 14) divided by NIPA Table 1.1.5 (Line 1, updated January 22, 2026).
  - Government Defense Spending: Defense expenditure data from 1800 to 2023 can be downloaded from https://www.usgovernmentspending.com/[9]. Historical federal defense spending is sourced from U.S. Bureau of the Census (1975).

[9] https://www.usgovernmentspending.com/download_multi_year_1792_2029USb_26s2li001mcny_31f30f

- **Housing Return** The nominal U.S. housing return data from 1891 to 2020 are sourced from Jordà, Schularick, and Taylor (2017). Housing total returns (housing_tr) are defined as $r_t = \frac{P_t + d_t}{P_{t-1}} - 1$. To obtain real housing returns, we adjust the nominal return series by subtracting annual inflation, also sourced from Jordà, Schularick, and Taylor (2017).

B.2 U.K. Data

- **Inflation**: From 1729 to 1945, inflation is calculated using the Millennium data (Thomas and Dimsdale, 2017) by dividing nominal GDP (from Sheet 'A9. Nominal GDP (A)', Column D) by real GDP (from Sheet 'A8. UK Real GDP(A)', Column D) and then taking the log difference to compute the GDP deflator. Between 1946 and 1959, quarterly CPI data are taken from the FRED series `CPIUKQ`, and inflation is calculated using log-differences of Q4 values. From 1960 to 1987, we use the FRED series `GBRCPALTT01IXNBM` (monthly, not seasonally adjusted), and compute inflation from log-differences of December values. For 1988 to 2023, monthly CPI data are from the UK Office for National Statistics (ONS), Series `L522` (CPIH Index), and inflation is computed using log-differences of December values.

- **Real GDP Growth**: Real GDP growth from 1729 to 2016 is derived from the Millennium data (Thomas and Dimsdale, 2017) by taking the log difference of the real GDP series in Sheet 'A8. UK Real GDP(A)', Column D. For 2017 to 2023, the data come from the UK ONS Series `IHYC`, which provides the Gross Domestic Product (Expenditure) chained volume index (seasonally adjusted), with log-differences used to compute growth.

- **Nominal Government Bond Return**: For the period 1730 to 2018, nominal returns are calculated using individual gilt prices and dividends from Ellison and Scott (2020a), and then value-weighted to obtain aggregate returns. We construct a UK gilt panel at the bond–month level and then construct the sample to December observations to obtain annual data from 1730 to 2018. For each bond i, we calculate the annual return as $r_{i,t} = \frac{P_{i,t} + C_{i,t}}{P_{i,t-1}}$, where $P_{i,t}$ denotes the bond price and $C_{i,t}$ the coupon payment. We then form a quantity-weighted annual gilt return index given by $R_t = \frac{\sum_i V_{i,t} r_{i,t}}{\sum_i V_{i,t}}$, where $V_{i,t}$ denotes the market value of outstanding bond i in year t. For 2019–2023, bond returns are aggregated using the bond-level total return index (TRI) from Table *BGSIndices* of the British Government Securities Database, available at `https://www.escoe.ac.uk/research/historical-data/fiscal-data/`.

- **Nominal Stock Return**: Stock returns from 1792 to 2020 are calculated using data on price growth and the PD ratio, as detailed below. For 2021 to 2023, returns are derived from the growth rate of the All Share Total Return Index provided by Bloomberg.

- **Price Growth (Stocks)**: From 1700 to 2016, stock price growth is based on the share price index in the Millennium data (Thomas and Dimsdale, 2017) (Sheet 'A31. Interest rates & asset ps', Column X). For 2017 to 2020, the data source is the FTSE All Share Price Index from GFD.

- **PD Ratio (Stocks)**: The PD ratio is constructed from multiple sources: for 1700–1812 and 1813–1870, the data are from (Golez and Koudijs, 2018); for 1871–2015, the source is the JST database (Jordà, Schularick, and Taylor, 2017), using column `AQ` labeled `eq_dp`; and for 2016–2020, we use the Datastream Terminal series `FTALLSH` with the data point `DY`.

- **Debt/GDP Ratio**: For 1729–2016, the Debt/GDP ratio is from Ellison and Scott (2020b) which aggregates all market values of individual UK gilts, then divided by nominal GDP (Millennium data (Thomas and Dimsdale, 2017) Sheet 'A9. Nominal GDP (A)' Column D Market prices). For 2017–2023, we impute the debt-to-GDP ratio by extrapolating our series using the growth rate of the UK central government debt-to-GDP ratio from FRED DEBTTLGBA188A .[10]

- **Tax Revenue and Government Spending**

[10] We do not use the Central government debt-to-GDP ratio from FRED because the series includes the entire stock of government liabilities including domestic and foreign currency and monetary deposits, and likely to be book value. The direct aggregation of issuance data from British Government Securities Database https://www.escoe.ac.uk/research/historical-data/fiscal-data/ is lower than the series from Ellison and Scott (2020b), likely due to missing T-bills, none-sterling issuance and convertables.

- Tax Revenue: For the period 1729–2016, we use the government revenue series from the Millennium dataset (Thomas and Dimsdale, 2017), specifically Sheet A27. Central govt borrowing (series ANBV), divided by nominal GDP from Sheet A9. Nominal GDP (A), Column D (market prices). To align fiscal-year data with the calendar year, we assume revenues are evenly distributed across quarters and compute calendar-year values accordingly. The adjusted series is shown in Column Q.

  For 2017–2023, we use the Public Finances Databank (December 2025) published by the UK Office for Budget Responsibility (OBR), available at https://obr.uk/public-finances-databank-2025-26/. Specifically, from the Sheet *Aggregates*, we construct the Revenue-to-GDP ratio by dividing current receipts (JW20, Column C) by nominal GDP (BKTL, Column AE).

- Government Spending: For the period 1729–2016, we use government spending data from the Millennium dataset (Thomas and Dimsdale, 2017), calculated as Expenditure net of interest (Sheet A27. Central Govt Borrowing, Column C minus Column H), divided by nominal GDP from Sheet A9. Nominal GDP (A), Column D (market prices). We apply the same fiscal-year to calendar-year adjustment as described above, assuming uniform quarterly distribution. The adjusted series is reported in Column O.

  For the period 2017–2023, government spending is constructed as current receipts minus the primary balance. Specifically, we use current receipts (JW20 in Column C) from the *Public Finances Databank* (December 2025), Table *Aggregates*, and subtract the primary balance ((J5II + JW2P − JW2L + JW2M)) in Column L.

- Government Defense Spending: We obtain defense spending data from 1700 to 2022 for the U.K. government from the Historical Public Finance Database maintained by the U.K. Office for Budget Responsibility, available at `https://articles.obr.uk/300-years-of-uk-public-finance-data/index.html`.

- **Housing Return** The nominal U.K. housing return data from 1896 to 2020 are sourced from Jordà, Schularick, and Taylor (2017). Housing total returns (housing_tr) are defined as $r_t = \frac{P_t + d_t}{P_{t-1}} - 1$. To obtain real housing returns, we adjust the nominal return series by subtracting annual inflation, also sourced from Jordà, Schularick, and Taylor (2017). Housing return data are unavailable for the subperiod from 1940 to 1946.