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The impact of debt and deficits on long term interest rates in the US

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June 2025

Abstract

We present new evidence on the impact of fiscal variables on long-term interest rates and term premia in the United States. To alleviate endogeneity problems, we follow the seminal methodology by Laubach (2009) and resort to long-term projections of interest rates and fiscal variables. After incorporating an additional 20 years of data into our sample, the estimated effects of debt and deficits on interest rates show little change from Laubach's findings. However, we show that the link between long-term rates and fiscal variables is not stable over time. It was close to zero during the years of relative fiscal prudence around the turn of the century and it has been increasing since fiscal positions have started to deteriorate markedly.

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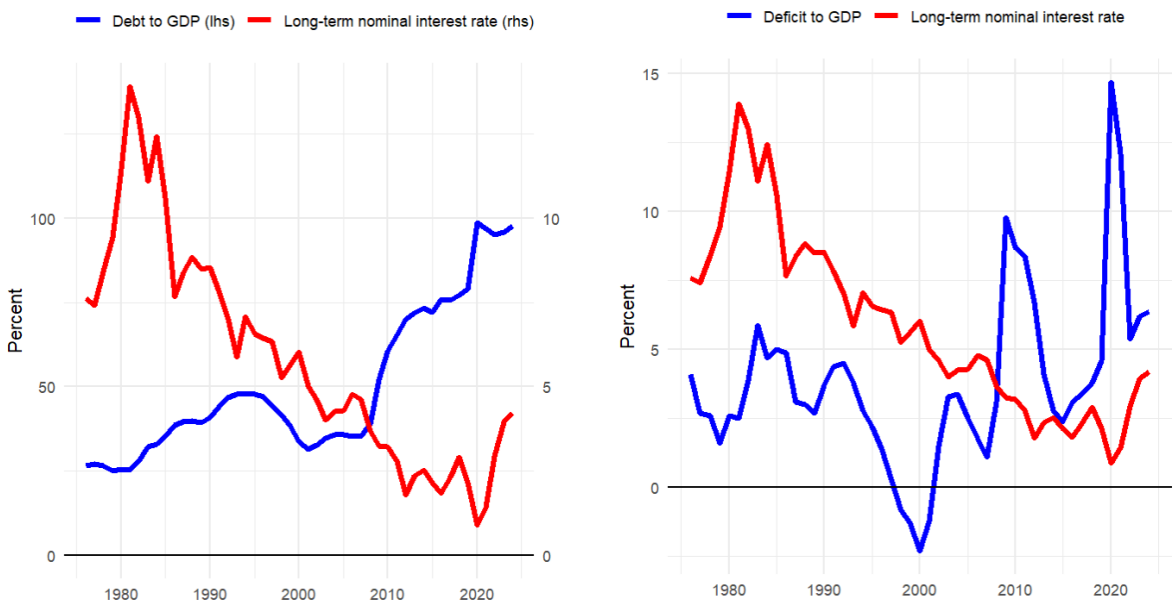
1 Introduction

Since 1980s, US long-term interest rates have been on a declining trend, while debt and deficits have consistently increased in most years. This trend has become more pronounced in the decade following the Global Financial Crisis (GFC), characterized by a continuous rise in debt-to-GDP levels in the United States, a sharp deterioration in fiscal deficits, and nominal interest rates reaching historically low levels, with real interest rates remaining significantly below real GDP growth rates (see Figure 1 and Appendix Figure A.1). This recent pattern has contributed to a more benign perspective regarding the costs associated with worsening fiscal positions (e.g., Blanchard 2019, Mankiw 2022, and Bernanke and Blanchard 2023).

Figure 1: Debt, Fiscal Balances and Long Term Interest Rates Over Time



Sources: CBO Historical Budget Data; and FRED.

Do these patterns imply that long-term interest rates have become less sensitive to increases in debt and deficit over time? Our results suggest that the answer is a qualified no.

For the entire 50-year sample period (1976-2025) we examine, the estimated effects of debt and deficits on long-term interest rates are statistically and economically significant, with magnitudes similar to those found in previous studies. However, a key contribution of this paper is to show that the relationship between long-term rates and fiscal variables has evolved over time. Specifically, these effects weakened markedly around the turn

of the century, a period of fiscal prudence and small deficits, but have been becoming stronger since then as fiscal position have started to deteriorate.

Estimating the effects of debt and deficits on long-term interest rates is complicated by the need to isolate variations in debt and deficits that are exogenous to other influences. In his seminal paper, Laubach (2009) proposed a novel method to address this identification problem by focusing on the relationship between long-horizon expectations of both interest rates and fiscal variables. The premise is that deficits, debt, and interest rates expected to prevail several years in the future are little affected by short-term factors related to the current state of the business cycle, thus reducing confounding effects including those induced by counter-cyclical monetary policy and automatic fiscal stabilizers.

While this strategy addresses some of the identification issues, numerous conceivable long-term factors jointly determine fiscal variables and interest rates. Therefore, we build on Laubach's approach and extend the set of control variables to include can affect long-term interest rates and fiscal variables at the same time — such as population growth forecasts, risk aversion, medium-term real GDP growth forecasts, and international purchases of US debt. The inclusion of these control variables further enhances the precision of the estimated effects.

Another threat to identification is that long-term interest rate forecasts can be used as inputs in long-term debt and deficit forecasts, leading to a positive bias in the estimated effects of debt and deficits on interest rates. To address this concern, we also examine the effect of primary deficits. In addition, we perform a robustness check utilizing bond term premia data from the Federal Reserve Board – computed following the methodology of Adrian, Crump and Moench (2013) – as an alternative dependent variable. Our results indicate that debt and deficits are positively and statistically significantly associated with higher term premia, with the magnitude of these effects comparable to those reported for long-term interest rates.[1]

Finally, the post-GFC period presents significant challenges for empirical analysis. While the US government debt trended upwards from the 1960s until the mid-1980s, it remained relatively stable for the following 20 years. This stability changed dramatically after 2008, when debt levels increased markedly and interest rates fell to historic lows. These patterns make it difficult to uncover a potentially positive impact of debt and deficits on long-term interest rates. However, as this paper demonstrates, after properly isolating the confounding influence of time trends, the impact of debt and deficits

1. In summary, term premia capture the difference between long-term rates and the expected long-term path of short-term rates, making it a more refined measure of risk. To the best of our knowledge, our work is the first to apply Laubach's methodology to investigate the impact of fiscal variables on term premia.

reemerges unscathed. Furthermore, their magnitudes appear to be on the rise.

Our paper is related to a large body of literature. Following Laubach (2009), several studies have investigated the relationship between fiscal variables and interest rates. Krishnamurhty and Vissing-Jorgesson (2012) and Greenwood et al (2015) address a similar question but, since their focus is on debt sustainability, they analyze the effect on $(r - g)$.[2] Their results, along with more recent estimations summarized in Mian et al (2024) "Goldilocks" paper (see Appendix Table A.1 in their paper), are consistent with our results.

In contrast to our work, most of the existing literature does not explore the impact of fiscal balances on interest rates, instead focusing on debt levels.[3] An exception is Heimberger (2023), which examines this relationship for a panel of 22 OECD countries using actual data rather than forecasts. That study finds no significant impact of lagged debt ratios on interest rates but estimates a highly significant negative coefficient linking $(r - g)$ to primary balances: stronger fiscal flows are associated with lower $(r - g)$. Our estimations support a similar conclusion: higher fiscal balances correspond to lower long-term rates and risk premia.

Finally, most of previous studies focus on sample periods that predate the COVID-19 pandemic. We show that the effect of debt and deficits on interest rates has been increasing since then.

The remainder of the paper is organized as follows. In Section 2, we discuss the data and methodology. In Section 3, we present the results for the entire sample and perform some robustness checks. In Section 4, we analyze potential shifts in the relation between fiscal variables and long-term interest rates. Section 5 briefly concludes.

2 Data and empirical strategy

Data on fiscal outcomes and nominal GDP (or GNP) forecasts are sourced from two separate databases: (a) the CBO GitHub Repository, and (b) PDF files of past "The Budget and Economic Outlook" reports. We combine these sources to compile the largest number of observations possible.

In the CBO's GitHub repository, only post-1984 figures are included for both fiscal variables. Additionally, debt forecasts are reported only once a year. On the positive side, the databases contain a wealth of data for deficits forecasts; for some years in the

2. r is the nominal interest rate and g is the nominal GDP growth. For more discussions on $(r - g)$ and sustainability, see Gale (2019), Lian, Presbitero, and Wiriadinata (2020), Mauro and Zhou (2021), Heimberger (2023), and Barro (2023).

3. For a discussion on whether economic theory associates flows or stocks to interest rates, see Laubach 2009.

GitHub repository, there are three different forecasts released at various months of the year.

For the coinciding dates in sources (a) and (b), fiscal numbers differ very little (See Appendix Figure A.2). Therefore, we chose to start from the GitHub data and supplement it with complementary observations retrieved from individual reports. This approach results in a total of 82 observations for debt forecasts and 106 observations for deficits forecasts both spanning from 1976 to January 2025.[4]

The CBO forecasts fiscal variables for various time horizons. In this paper, we use 5-year-ahead projections of debt and deficits throughout the analysis. Since the CBO did not release debt projections for years 1976 to 1983, we calculated debt projections for these years by adding the CBO's total deficit projections to the actual debt held by the public at the end of the preceding fiscal year. Additionally, we create a series of primary balances by deducting net interest payments from total balances.

Three different interest rates measures are used: (i) the 10-year Treasury yield, (ii) the 5-10 year forward rate and (iii) the 10-15 year forward rate. Consistent with Laubach's study, forward rates are sourced from Gurkaynak, Sack, and Wright (2007).[5] Additionally, as a robustness check, we also use the 5-year and 10-year bond term premia data from Adrian, Crump and Moench (2013).

Long-term inflation expectations directly impact long-term nominal interest rates for a given real rate. Consequently, most papers in the literature include inflation expectations as a control variable. Although our results are unchanged when using five-year inflation expectations from the Michigan Survey (available since 1978), our preferred models use short-term nominal interest rates instead.[6] Including the 3 months Treasury Bill rate, instead of inflation expectations, is preferable as it reflects developments in market-based inflation expectations instead of survey data and it simultaneously accounts for monetary policy actions and other confounding factors associated with the business cycle. To further isolate business cycle influences, we also include recession dummies (based on NBER dating).

In the standard neoclassical model, risk aversion and long-term total factor productivity (TFP) play a key role in determining long-term interest rates, and we take these factors into account in the empirical analysis. For risk aversion, we use the Excessive

4. We have removed the CBO forecasts from 1981 in our dataset due to the substantial discrepancies between the baseline projections and the anticipated budget resolution for 1982, affecting both fiscal and economic variables. The considerable uncertainty surrounding future fiscal policies rendered the baseline projections significantly divergent from the actual trajectory (for further details, see Baseline Budget Projections: Fiscal Years 1982-1986).

5. Still being updated by Wright.

6. For inflation expectations, Laubach's work uses different sources for different data periods, which is not ideal.

Bond Premium (EBP), from Gilchrist and Zakrajšek (2012), which has been updated by the Federal Reserve Board of Governors; the data are available on a monthly basis since 1978. Due to the lack of data on expected TFP growth, we instead employ predicted long-term growth in our estimations. This series is constructed as follows: we take the expected nominal GDP five years ahead from the CBO reports to create a series of nominal growth rates. We then subtract the long-term inflation expectations reported in the Michigan Consumer Surveys, which have been available since 1979.

We also include 5-year ahead population growth projections from the United Nations World Population Prospects Database. Ex-ante, the sign of the effect of population growth on interest rates is ambiguous. In a simple overlapping generations (OLG) model, higher population growth leads to more savings (for a given dependency ratio), which in turn results in lower interest rates in partial equilibrium. However, population growth also affects investment demand, making the final effect on interest rates uncertain. As Goodhart and Pradhan (2017) aptly state, "with ex-ante savings and ex-ante investment moving in the same direction, assessing the likely balance between the two becomes problematic".

Finally, we incorporate the share of foreign-held Treasuries to control for the impact of other factors affecting long-term interest rates—such as changes in global appetite for US bonds, savings gluts, and other related factors. Data on the total amount of Treasury securities and foreign holdings are sourced from the Haver Analytics database.[7]

The following equation is used to the estimate the effect of debt and deficits on long-term interest rates: [8]

$$y_t = c + \alpha F_t + \beta ST_t + \gamma X_t + \epsilon_t \tag{1}$$

Where

- y is the long-term interest rates;
- c is a constant;
- ST is the short-term interest rates (Tbill 3months);
- F is the fiscal variable of interest;
- X is a vector of other controls described above;
- ϵ is the error term.

7. For detailed statistic description, see Appendix Table A.1
8. Equation (1) is estimated using OLS with Newey-West standard errors.

3 Baseline results

In the following sections, we present results obtained from estimating equation (1) using five alternative dependent variables: (i) 10-year Treasuries returns; (ii) 5-10 year forward rates (average of yearly forward rates at 5,6,7,8 and 9 years from the current date); (iii) 10-15 year forward rates (the average of yearly forward rates from 10 to 14); and (iv-v) both 5-year and 10-year bond term premia.

The fiscal variables considered are the 5-year ahead expected debt, fiscal balance and primary balance. All regressions reported below include linear and quadratic trends and a constant, which are omitted from most tables to simplify exposition.

We begin by presenting the results obtained using a very parsimonious model, controlling only for short-term interest rates and a linear and quadratic trend(Table1).[9] The results confirm that high debt and deficits are associated with higher long-term rates. Out of the 15 different combinations reported, only 2 do not achieve statistical significance (although the point estimates are similar to those of other combinations, their standard errors are larger).

Remarkably, the magnitudes are quite similar to those found in Laubach's original study, despite roughly doubling the sample size. In particular, a 10 percent of GDP increase in expected debt is associated with an increase in long-term rates of between 20 and 30 basis points. Conversely, a 1 percent of GDP increase in the fiscal and primary balances is associated with a decrease in long-term rates of approximately 20 to 30 basis points.

9. When term premium is the dependent variable, we drop the short-term interest rate from the estimations.

Table 1: Main Results: Full sample

	Dependent variable:				
	Fwrd:5-10y	**Fwrd:10-15y**	**T10**	**TPrem5y**	**TPrem10y**
Debt	0.027**	0.028	0.023**	0.017*	0.020*
	(*0.009*)	(*0.018*)	(*0.013*)	(*0.009*)	(*0.012*)
Fiscal Balances	−0.222***	−0.260	−0.262***	−0.155***	−0.192***
	(*0.056*)	(*1.550*)	(*0.119*)	(*0.049*)	(*0.067*)
Primary Balances	−0.269***	−0.299***	−0.313***	−0.186**	−0.226
	(*0.078*)	(*0.103*)	(*0.097*)	(*0.083*)	(*0.483*)

Source: IMF staff estimates.
Note: Each column corresponds to a separate regression $y_t = c + \alpha F_t + \beta ST_t + \gamma X_t + \epsilon_t$. Here,$X_t$ is comprised of a linear-quadratic trend. All coefficients reported with Newey-West standard errors in parentheses. Statistical significance at the 10% (p<0.1), 5% (p<0.05), and 1% (p<0.01) levels is indicated by *, **, and ***, respectively. Controls not reported are: linear-quadratic trends and Tbill3m. We have 106 observations for predicted fiscal balances and 81 for debt. Fwrd stands for forward rates, T10 is the 10 years maturity Treasury and TPrem are the term premia.

Next, we incorporate the set of controls discussed in Section 2. Including these control variables proves to be important: most of them are statistically significant, which enhances the overall fit of the regressions, and the precision of the effects of the fiscal variables markedly improves (Table 2-4).

In line with the predictions of the standard neoclassical model, we find that expected real growth is associated with higher interest rates.[10] A greater global appetite for US bonds, proxied by a higher share of foreign holding of Treasuries is associated with lower interest rates.[11] The coefficient for the recession dummies is positive, once controlling for short-term rates. This can reflect the fact that during recessions short-term interest rates fall while fiscal policy becomes expansionary, which can trigger expectations of higher future interest rates. Finally, population growth is associated with higher long-term interest rates, suggesting that its effect on saving is more than offset by an anticipated larger demand for capital. In contrast, we do not find significant effect for the EBP.

10. This is a finding that does not show up in Laubach's original work.
11. see Neveu and Schaufer (2024).

Table 2: Extra Controls: Debt

	Dependent variable:				
	Fwrd:5-10	**Fwrd:10-15**	**T10**	**TPrem5y**	**TPrem10y**
Debt	0.017*	0.019**	0.014**	0.023***	0.025***
	(0.009)	(0.009)	(0.007)	(0.007)	(0.008)
Tbill3m	0.216***	0.195***	0.458***		
	(0.068)	(0.069)	(0.056)		
GDP growth (next 5y):	0.287*	0.525***	0.084	0.296***	0.364***
	(0.146)	(0.147)	(0.119)	(0.114)	(0.135)
Foreign Holdings share	−0.110***	−0.112***	−0.060**	−0.067**	−0.076*
	(0.030)	(0.031)	(0.025)	(0.029)	(0.042)
Risk (EBP)	−0.033	−0.188	−0.111	0.220	0.228
	(0.196)	(0.198)	(0.160)	(0.161)	(0.180)
Recession Dummy	0.746*	0.962**	0.472	0.455**	0.592**
	(0.389)	(0.393)	(0.318)	(0.202)	(0.238)
Pop growth	2.196***	1.930**	1.542**	0.778	0.943
	(0.761)	(0.769)	(0.621)	(0.568)	(0.636)
Linear trend	−11.923***	−10.980***	−11.581***	−5.494***	−5.932***
	(2.926)	(2.955)	(2.387)	(1.970)	(2.202)
Quadratic trend	1.377	0.349	1.827	−3.380**	−3.420*
	(1.999)	(2.018)	(1.630)	(1.673)	(2.024)
Constant	3.825***	4.017***	2.414***	0.553	0.648
	(1.061)	(1.071)	(0.866)	(0.587)	(0.640)

Source: IMF staff estimates.
Note: Each column corresponds to a separate regression $y_t = c + \alpha F_t + \beta ST_t + \gamma X_t + \epsilon_t$. Here, F_t is the predicted debt. All coefficients reported feature Newey-West standard errors in parentheses. Statistical significance at the 10% (p<0.1), 5% (p<0.05), and 1% (p<0.01) levels is indicated by *, **, and ***, respectively. Sample size now is 103. Fwrd stands for forward rates, T10 is the 10 years maturity Treasury and TPrem are the term premia.

Table 3: Extra Controls: Fiscal Balances

	Fwrd:5-10	**Fwrd:10-15**	**T10**	**TPrem5y**	**TPrem10y**
Total Balances	-0.230^{***}	-0.231^{***}	-0.206^{***}	-0.214^{***}	-0.228^{***}
	(0.058)	(0.058)	(0.046)	(0.047)	(0.051)
Tbill3m	0.225^{***}	0.205^{***}	0.467^{***}		
	(0.061)	(0.062)	(0.049)		
GDP growth(5 years ahead)	0.268^{*}	0.497^{***}	0.072	0.296^{***}	0.364^{***}
	(0.136)	(0.137)	(0.108)	(0.114)	(0.135)
Foreign Holdings	-0.104^{***}	-0.107^{***}	-0.054^{**}	-0.055^{**}	-0.063^{***}
	(0.029)	(0.029)	(0.023)	(0.021)	(0.023)
Risk (EBP)	0.081	−0.064	−0.001	0.220	0.228
	(0.192)	(0.194)	(0.153)	(0.161)	(0.180)
Recession Dummy	0.745^{*}	0.935^{**}	0.457	0.455^{**}	0.592^{**}
	(0.401)	(0.405)	(0.319)	(0.202)	(0.238)
Pop. Growth	1.568^{**}	1.309^{*}	0.914	0.778	0.943
	(0.776)	(0.784)	(0.618)	(0.568)	(0.636)
Linear Trend	-12.195^{***}	-11.104^{***}	-12.115^{***}	-5.494^{***}	-5.932^{***}
	(2.768)	(2.797)	(2.204)	(1.970)	(2.202)
Quadratic Trend	−0.098	−0.996	0.393	-3.380^{**}	-3.420^{*}
	(1.898)	(1.918)	(1.511)	(1.673)	(2.024)
Constant	4.752^{***}	5.078^{***}	3.195^{***}	0.553	0.648
	(0.759)	(0.767)	(0.604)	(0.587)	(0.640)

Source: IMF staff estimates.
Note: Each column corresponds to a separate regression $y_t = c + \alpha F_t + \beta ST_t + \gamma X_t + \epsilon_t$. Here, F_t is the predicted total fiscal balance. All coefficients reported feature Newey-West standard errors in parentheses. Statistical significance at the 10% (p<0.1), 5% (p<0.05), and 1% (p<0.01) levels is indicated by *, **, and ***, respectively. Sample size now is 103. Fwrd stands for forward rates, T10 is the 10 years maturity Treasury and TPrem are the term premia.

Table 4: Extra Controls: Primary Balance

	Dependent variable:				
	Fwrd:5-10	**Fwrd:10-15**	**T10**	**TPrem5y**	**TPrem10y**
Primary Balance	−0.245***	−0.247***	−0.237***	−0.246***	−0.257***
	(0.080)	(0.080)	(0.063)	(0.067)	(0.078)
Tbill3m	0.226***	0.206***	0.473***		
	(0.066)	(0.066)	(0.052)		
GDP growth(5 years ahead)	0.267*	0.496***	0.071	0.293**	0.361**
	(0.142)	(0.143)	(0.112)	(0.132)	(0.174)
Foreign Holdings	−0.118***	−0.121***	−0.065***	−0.067**	−0.076*
	(0.029)	(0.030)	(0.023)	(0.029)	(0.042)
Risk (EBP)	0.063	−0.081	−0.006	0.211	0.216
	(0.201)	(0.203)	(0.159)	(0.156)	(0.171)
Recession Dummy	0.673	0.863**	0.393	0.399**	0.530**
	(0.417)	(0.421)	(0.330)	(0.196)	(0.227)
Pop. growth	2.113***	1.856**	1.367**	1.261*	1.463
	(0.779)	(0.787)	(0.617)	(0.740)	(1.047)
Linear Trend	−11.284***	−10.191***	−11.394***	−4.821	−5.174
	(2.859)	(2.887)	(2.263)	(2.979)	(4.474)
Quadratic Trend	0.685	−0.220	0.792	−2.868	−2.820
	(2.013)	(2.033)	(1.594)	(2.385)	(3.475)
Constant	5.082***	5.411***	3.485***	0.891	1.000
	(0.784)	(0.792)	(0.621)	(0.561)	(0.667)

Source: IMF staff estimates.
Note: Each column corresponds to a separate regression $y_t = c + \alpha F_t + \beta ST_t + \gamma X_t + \epsilon_t$. Here, F_t is the predicted primary balance. All coefficients reported feature Newey-West standard errors in parentheses. Statistical significance at the 10% (p<0.1), 5% (p<0.05), and 1% (p<0.01) levels is indicated by *, **, and ***, respectively. Sample size now is 103. Fwrd stands for forward rates, T10 is the 10 years maturity Treasury and TPrem are the term premia.

4 Estimates over time

We now examine how the relationship between projected fiscal outcomes and long-term interest rates has evolved over time. First, we examine specific subsamples: (i) the pre-GFC crisis years and (ii) the pre-COVID years. Second, we reestimate our models using rolling-windows regressions that contain 40 observations each. These encompass roughly 20 years in the case of debt. Since the number of reports containing information on fiscal balances increases over time, the number of years in each subsample varies between 15 and 25 for each window. We include the full set of controls in all specifications.

4.1 Pre-GFC and Pre-COVID periods

Checking if our specifications yield similar results for the pre-GFC period is an important robustness check, as this is the period used in the original Laubach (2009) paper. During this period, interest rates were consistently above zero and debt did not increase uninterruptedly.

Why not also look at the years 1976-2019 years? The post-2020 years were exceptional in several ways and have been characterized by: (a) the rapid decline and subsequent recovery of output, (b) unprecedented fiscal expansion and inflation surges. It is therefore worth examining whether excluding this atypical period alters our findings. Reassuringly, this is not the case.

When we restrict the sample to the pre-GFC period, our results barely change, as shown in Table 5. The estimated coefficients for fiscal balances and debt (around -0.25 and 0.03, respectively) are also very close to those first reported by Laubach (2009).[12]

12. Differently from Laubach (2009), we use fiscal balances, not fiscal deficits, which explains why our coefficients are negative. See details in Appendix Table A.2.

Table 5: Subsample: Pre-GFC Period

	Dependent variable:				
	Fwrd:5-10y	**Fwrd:10-15y**	**T10**	**TPrem5y**	**TPrem10y**
Debt	0.028**	0.034**	0.029***	0.022**	0.026**
	(*0.012*)	(*0.016*)	(*0.014*)	(*0.009*)	(*0.011*)
Fiscal Balances	−0.210***	−0.245***	−0.207***	−0.137***	−0.160***
	(*0.067*)	(*0.062*)	(*0.058*)	(*0.048*)	(*0.059*)
Primary Balances	−0.272***	−0.363***	−0.268***	−0.180***	−0.210***
	(*0.066*)	(*0.061*)	(*0.076*)	(*0.061*)	(*0.068*)

Source: IMF staff estimates.
Note: Each column corresponds to a separate regression. All coefficients reported with Newey-West standard errors in parentheses. Statistical significance at the 10% (p<0.1), 5% (p<0.05), and 1% (p<0.01) levels is indicated by *, **, and ***, respectively. Only fiscal controls reported, but all included. Fwrd stands for forward rates, T10 is the 10 years maturity Treasury and TPremia are the term premia.

For this subsample, the point estimate suggests that a deterioration in the primary balance of 2 percentage points of GDP is associated with increase in forward rates of more than 60 basis points.

Table 6 below suggests the estimations for the pre-COVID period are also very similar in magnitude. Importantly, when excluding the post-COVID years, standard errors decrease across the board compared to the full sample. Notably, the size of the coefficients linking fiscal balances to term premia all increase in magnitude.

Table 6: Subsample: Pre-COVID Period

	Dependent variable:				
	Fwrd:5-10y	**Fwrd:10-15y**	**T10**	**TPrem5y**	**TPrem10y**
Debt	0.020**	0.022**	0.019**	0.021***	0.025***
	(*0.009*)	(*0.010*)	(*0.008*)	(*0.006*)	(*0.008*)
Primary Balances	−0.323**	−0.361***	−0.297***	−0.243***	−0.295***
	(*0.119*)	(*0.111*)	(*0.098*)	(*0.067*)	(*0.086*)
Fiscal Balances	−0.250***	−0.271***	−0.229***	−0.189***	−0.231***
	(*0.090*)	(*0.081*)	(*0.076*)	(*0.052*)	(*0.066*)

Source: IMF staff estimates.
Note: Each column corresponds to a separate regression. All coefficients reported with Newey-West standard errors in parentheses. Statistical significance at the 10% (p<0.1), 5% (p<0.05), and 1% (p<0.01) levels is indicated by *, **, and ***, respectively. Here we display only the fiscal controls, but all have been included in the regression.

4.2 Rolling-windows regressions

We conclude by applying rolling-windows regressions to investigate how the parameters of interest evolved over time. For all regressions we run, the number of *observations* is set equal to 40. This means each coefficient is estimated using approximately 20 years of data ending at the date displayed in the chart. As before, we experiment with both debt and balances and test the implications for forward rates and term premia.

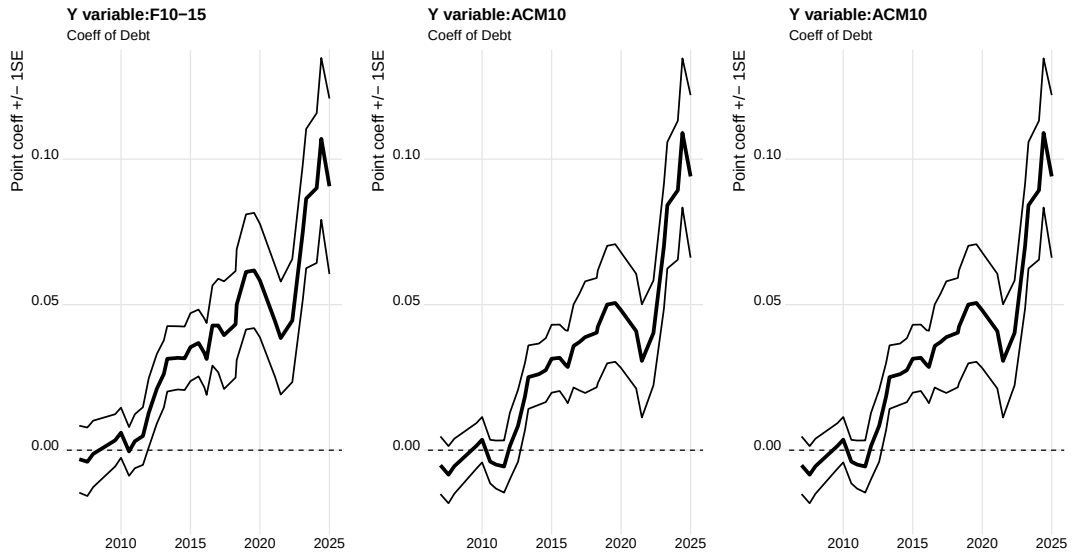
Figure 2 depicts our findings.[13] Overall, the estimates reveal that the magnitude of the coefficients linking fiscal forecasts to long-term interest rates and term premia were close to zero in the twenty or so years ending between 2005 and 2010. Interestingly, this period coincides with low projected debt and deficits (see Appendix Figure A.3).

The effects increase thereafter, as discal positions markedly deteriorated and despite low short-term interest rates.

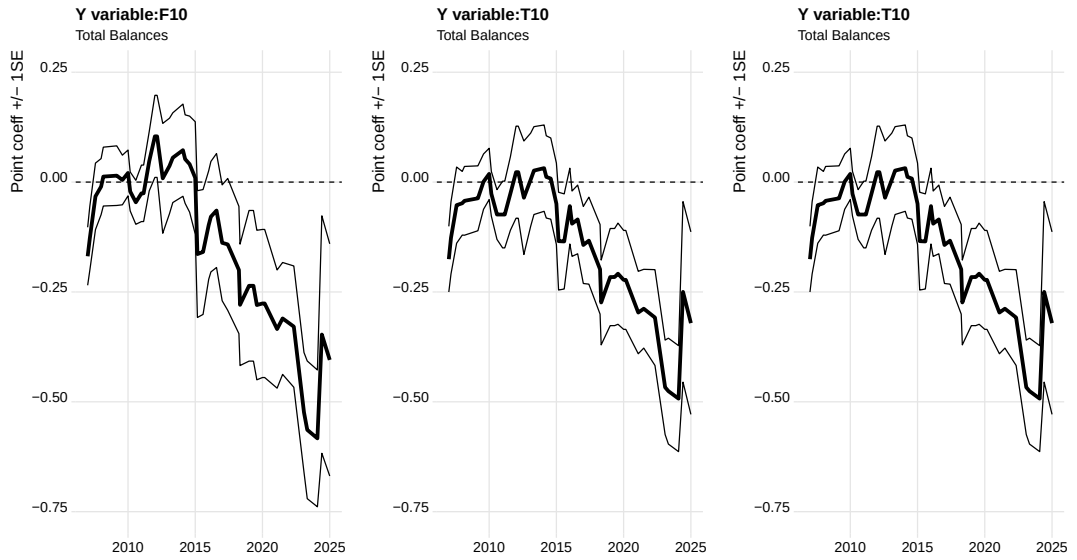
13. To save space, we report the results for primary balance in the Appendix (Appendix Figure A.4). Results for the 5-year bond term premia are very close to those obtained for the 10-year, and thus not reported, but available upon requests.

Figure 2: Debt, Fiscal Balance and Long-Term Interest Rates: Rolling-windows Regressions

(a) Predicted Debt as explanatory variable for Forward 10-15 years, Treasury 10, and Term Premia 10.



(b) Predicted Balances as explanatory variable for Forward 10-15 years, Treasury 10, and Term Premia 10.



Source: IMF staff estimates.
Note: Each β coefficient results from a regression employing 40 observations. The rolling-window drops and adds 1 observation; until 1990s this is equivalent to 1 one year out and one year in; the interval depicted encompasses. Bold lines denotes point estimates; solid lines indicate one-standard deviation confidence bands.

5 Conclusions

For academics and policymakers alike, understanding how fiscal policy in the United States impacts long-term interest rates is crucial. This has arguably become even more important in an environment of increasing debt levels.

Our study confirms that higher debt and deficits translate into higher long-term interest rates. For the entire 50-year sample period (1976-2025) we examine, the estimated effects of debt and deficits on long-term interest rates are statistically and economically significant, with magnitudes similar to those found in previous studies. All else being equal, long-term rates rise by 20 to 30 basis points in response to a 1 percentage point increase in the projected deficit-to-GDP ratio, and by the same amount in response to a 10 percentage points increase in the projected debt-to-GDP ratio.

We also show that the relationship between long-term rates and fiscal variables has evolved over time. It has weakened markedly for a brief period of time since the late 1970s: around the turn of the century, when US ran fiscal primary surpluses and debt to GDP was at levels unimaginable today.

Interestingly, as the fiscal position deteriorates, the estimated effects increase even when the years of very low short-term interest rates enter the estimation sample. Low interest rates are not tantamount to low effects; low deficits and debt seem to be. The results imply that projected higher deficit and debt in the United States is likely to further increases long-term interest rates and debt financing costs.

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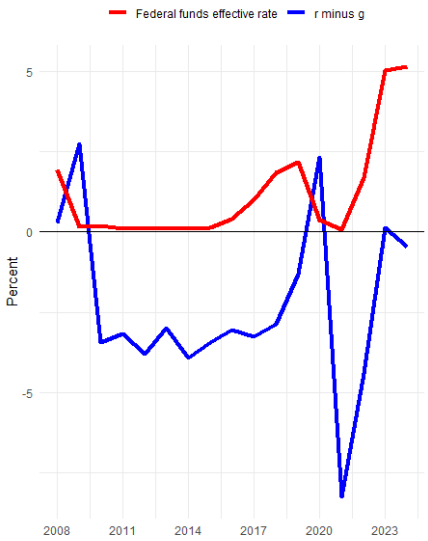
A Appendix

A.1 Figures

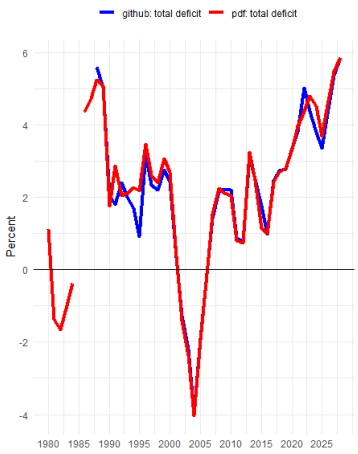
Figure A.1: Short Term Interest Rate and $(r - g)$ after GFC



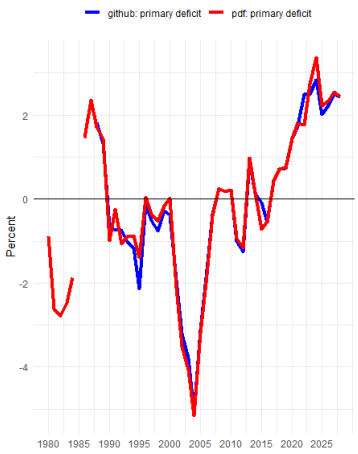
Sources: FRED; and IMF staff calculations.
Note: r is the 1-year real interest rate, and g is the percent change in real GDP. The figure shows that since the ZLB after GFC, $(r - g)$ remained negative in most of time.

Figure A.2: CBO Github Repository, and The Budget and Economic Outlook Reports 5-Year-Ahead Projections

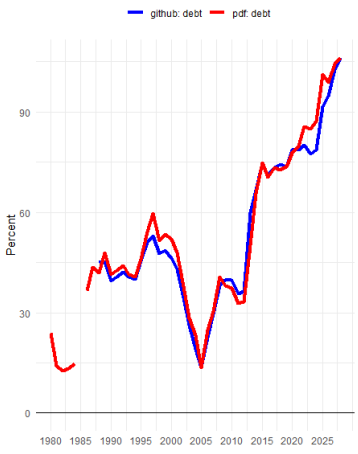
(a) Total deficit



(b) Primary deficit

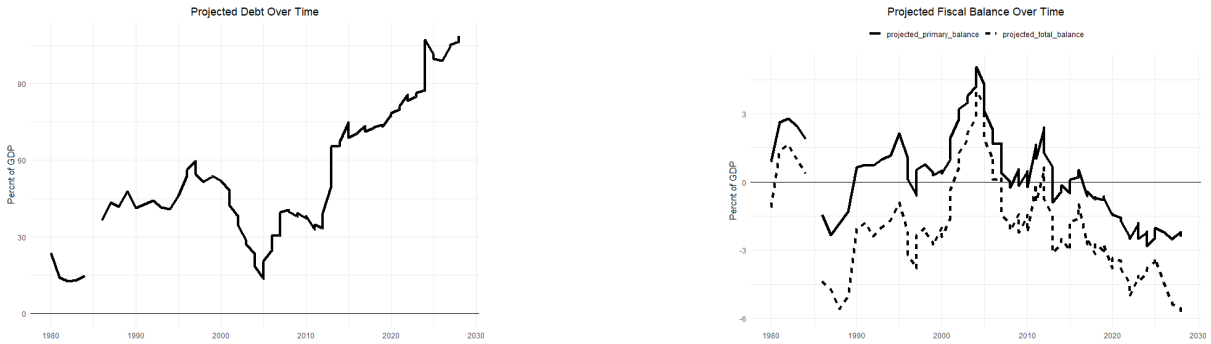


(c) Debt



Sources: CBO Github Repository; and The Budget and Economic Outlook Reports.

Figure A.3: Projected Debt and Fiscal Balances Over Time



Sources: CBO Github Repository; The Budget and Economic Outlook Reports, and IMF staff calculations.

A.2 Tables

Table A.1: Summary Statistics

	Mean	Median	SD	Max	Min	Source
Interest rates variables						
Treasuries 10 years returns	5.897	5.284	3.275	15.324	0.624	FRED.
Forward rates 5-10 years avg.	6.400	6.028	2.991	14.221	0.901	Gurkaynak, Sack, and Wright (2007).
Forward rates 10-15 years avg.	6.757	6.487	2.874	14.567	1.429	Gurkaynak, Sack, and Wright (2007).
5 years term premia	1.052	1.099	1.086	3.789	-1.148	Adrian, Crump, and Moench (2013); and Federal Reserve Bank of New York.
10 years term premia	1.643	1.793	1.443	5.193	-1.350	Adrian, Crump, and Moench (2013); and Federal Reserve Bank of New York.
CBO projection variables						
Projected total balance	-1.858	-2.175	2.199	3.973	-5.864	CBO GitHub Repository; CBO reports; and IMF staff calculations.
Projected primary balance	0.335	0.373	1.839	5.076	-2.828	CBO GitHub Repository; CBO reports; and IMF staff calculations.
Projected debt	55.703	51.601	26.021	108.591	12.624	CBO GitHub Repository; CBO reports; and IMF staff calculations.
Additional control variables						
3 months treasury bill rate	4.270	4.560	3.493	16.300	0.010	FRED.
Expected 5 years real growth	2.051	1.900	0.856	4.100	0.500	CBO reports; Michigan Survey; and IMF staff calculations.
Foreign holdings	22.903	23.419	7.136	34.135	11.341	Havar Analytics; and IMF staff calculations.
Excessive bond premium	0.045	-0.075	0.548	3.508	-1.053	Gilchrist and Zakrajšek (2012); and Federal Reserve Board of Governors.
Recession Dummy	0.098	0.000	0.298	1.000	0.000	FRED.
Population growth	0.917	0.967	0.201	1.216	0.173	United Nations; and IMF staff calculations.
1 year expected inflation	4.544	4.000	1.908	13.800	1.000	Michigan Survey.

Source: IMF staff calculations.

Table A.2: Estimated Coefficients of Fiscal Balance and Debt on Long-Term Interest Rates in US – Pre GFC

Study	Dependent variable	Sample	Estimated coefficient	SD
Debt				
Laubach (2009)	T10	1976-2006	0.015	0.016
Laubach (2009)	Forward: 5-10	1976-2006	0.032	0.014
Laubach (2009)	Forward: 5-15	1976-2006	0.034	0.014
This paper	T10	1976-2007	0.032	0.017
This paper	Forward: 5-10	1976-2007	0.036	0.024
This paper	Forward: 5-15	1976-2007	0.039	0.021
Total deficit				
Laubach (2009)	T10	1976-2006	0.13	0.088
Laubach (2009)	Forward: 5-10	1976-2006	0.23	0.074
Laubach (2009)	Forward: 5-15	1976-2006	0.24	0.074
This paper	T10	1976-2007	0.199	0.062
This paper	Forward: 5-10	1976-2007	0.232	0.093
This paper	Forward: 5-15	1976-2007	0.257	0.094
Primary deficit				
This paper	T10	1976-2007	0.271	0.075
This paper	Forward: 5-10	1976-2007	0.318	0.116
This paper	Forward: 5-15	1976-2007	0.363	0.125

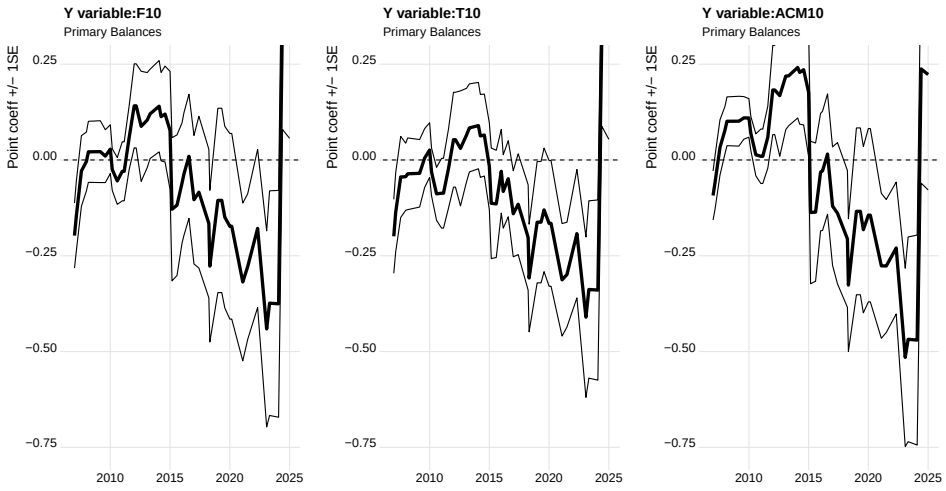
Sources: Laubach 2009; and IMF staff estimates.
Note: To align with Laubach's work, we take the negative values of the estimated coefficients related to budget balance (for both total and primary balance) as the estimated coefficients for budget deficits. SD is the estimated standard errors in each regression.

A.3 Extra time varying results

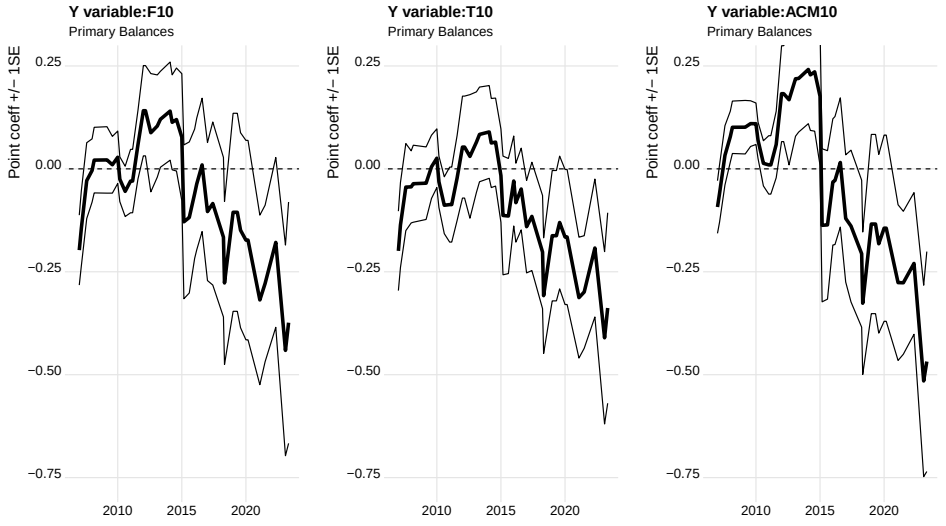
Figure A.4 below report the time-varying results using primary balances forecasts as the main regressor. The results in the top panel are based on the full sample whereas those in the bottom panel are based on data up to 2024 (that is, excluding 3 observations).

Figure A.4: Primary Balance and Long-Term Interest Rates: Rolling-windows Regressions

(a) Full sample



(b) Pre-2024 sample.



Source: IMF staff estimates.
Note: Each β coefficient results from a regression employing 40 observations. The rolling-window drops and adds 1 observation; until 1990s this is equivalent to 1 one year out and one year in; the interval depicted encompasses Bold lines denotes point estimates; solid lines indicate one-standard deviation confidence bands.