NATIONAL BANK OF CANADA
FINANCIAL MARKETS

August 12, 2021

Table of Contents

U.S. federal debt service cost: What if interest rates normalize faster than projected?

By P.-A. Pinsonnault

Introduction

The significant rise of the U.S. debt-to-GDP ratio in the last financial crisis brought renewed interest in the question of debt sustainability. Papers by academics argued that public debt beyond some threshold braked economic growth. But further reviews of the data and of the methodology used by researchers has led the IMF to conclude that there is no simple threshold for debt ratios above which medium-term growth prospects are severely undermined. Contributing to the lack of a decisive conclusion on the matter is the issue of causality. High debt may be the result of sluggish growth or it could reflect another factor, or omission of variables that simultaneously increase debt and reduce growth. An obvious example would be financial crises. That said, the IMF warned in 2014 that although it could not pinpoint a critical ratio above which medium-term growth was at risk, neither could it conclude that debt does not matter.

Seven years later, debt-to-GDP ratios have further deteriorated and over the next 10 years the U.S. federal debt is projected to grow significantly faster than nominal GDP. But the conventional wisdom, shared by the Fed, remains that "given the low level of interest rates, there's no issue about the United States being able to service its debt at this time or in the foreseeable future." (Jerome Powell, March 25 NPR interview). Many not only endorse that view but quickly conclude that the likely persistence of low rates for Treasury borrowing means that debt reduction is not an urgent need.

There is a caveat. We know that demographic trends will translate into large increases in spending for Social Security and Medicare as more and more baby boomers retire from the labour force. It should also be noted that although surveys show people favouring "small government," they also want roads and bridges maintained, borders secured, veterans cared for, food and drugs inspected and medical research supported by federal funding. The list goes on. In managing budget spending day to day, politicians know that cutting spending is not easy. The point is that the growth of federal spending is driven to a large extent by the requirements of social programs and of non-discretionary obligations like debt service. Which brings us to the argument put forward in 2016 by Douglas Elmendorf, dean of Harvard's Kennedy School of Government after six years as director of the Congressional Budget Office: since interest-rate projections are highly uncertain, policymakers should be mindful of the risk that rates will rise above current expectations. Tax increases may be one way of closing the gap between revenue and spending, but Elmendorf reminded policymakers that large changes in fiscal policy are best made slowly.

While the IMF did not venture a maximum debt-to-GDP ratio, one rule of thumb suggests that when debt service cost exceeds 14% of revenue, governments face hard choices. What programs should get money? Should tax rates be raised? What would be the effect of a tax hike on consumption and investment?

Debt held by the public

There are various ways to look at the indebtedness of the U.S. Treasury, each having its role and limitations. The Congressional Budget Office (CBO) publishes regular budget and economic projections. In its *Federal Debt: A Primer* of March 2020, one can read that current practice is to focus on debt held by the public, consisting mainly of marketable debt such as Treasury bills, notes, bonds, FRNs and TIPS sold to investors at regular auctions. These securities can be traded on the secondary market. They account for by far the largest portion of debt held by the public. However the Treasury also issues nonmarketable securities to the public. One well-known example is savings bonds, which are issued in response to investor demand and cannot be traded on the secondary market. The issuance of nonmarketable debt, unlike that of marketable securities, is not tied to the size of the federal deficit.

Debt held by the public is a measure indicating the extent to which federal borrowing affects the availability of private funds to other borrowers.

Federal trust funds also own Treasuries, but the value of these securities is not a meaningful measure of the government's long-term obligations for those programs. It is more or less an accounting mechanism, with no net effect on federal borrowing from the public or on the total budget. The sum of debt held by the public and Treasury securities held by federal trust funds and other government accounts is called the gross debt.

The table on the following page presents a projection by the Office of Management and Budget (OMB) that may shed some light on how budget deficits affect the various measures of debt outstanding mentioned in the CBO *Primer*.

Federal Borrowing and Debt OMB analytical perspective	US$ billion
Year end 2020	
Gross Federal Debt	26,902.5
Issued by Treasury	26,881.0
Issued by Agency	21.5
Held by Government accounts	5,885.8
Held by the public (A)	21,016.7
Budget projection 2021	
Budget deficit	3,668.7
Changes in Treasury operating cash	-1031.70
Disbuersment of credits accounts	513.7
Total public borrowing requirements (B)	3,150.7
Debt - Year end 2021	
Debt Held by Public year end = (A+B)	24,167.4
Debt held by government accounts	6,058.8
Gross Federal Debt	30,225.6
Issued by Treasury	30,204.3
Issued by Agency	21.3

NBF Economics and Strategy (Source: OMB)

The U.S. government also owns financial assets. Net of financial assets, debt held by the public in 2020 stood at 85.8% of GDP rather than 100.1%. In the federal budget, revenue from these assets together with receipts from intragovernmental transactions offset part of the gross interest payment on the debt.

Debt held by the public net of financial assets	
Year end 2020	
Debt Held by Public	21,016.7
Financial assets net of liabilities	2,993.0
DHBP net of financial assets	18,023.6
As a percentage of GDP	85.8

NBF Economics and Strategy (Source: OMB)

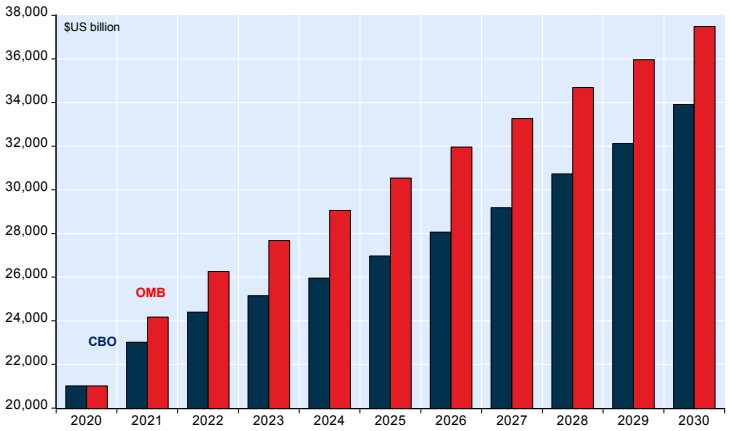
In 2020, gross interest of US$523 billion was paid on Treasury securities, but since the government received US$178 billion in interest revenue, budget documents showed net interest outlay of US$345 billion.

In that year the government spent $1.627 trillion on discretionary programs, $4.578 trillion on mandatory outlays and $345 billion in net interest payments, for a total of $6.550 trillion. Revenue was $3.421 trillion, for a budget deficit of $3.129 trillion.

OMB and CBO projections

The OMB document presents President's proposed budget. As usual the budget will go through a long process before a final version is enacted. That version will undoubtedly be different from President Biden's proposal, which includes a wide range of spending on infrastructure. It also includes a plan to reverse some of the 2017 tax cuts and eliminate a series of tax loopholes. His proposed budget holds that "over time, the savings from these reforms would exceed the cost of the investments, and by large and growing amounts. The American Jobs Plan and American Families Plan together are paid for over 15 years." The projections underlying the president's budget show government revenue growing from 16.3% of nominal GDP in 2020 to 19.7% by 2030 and debt held by the public reaching $37.481 trillion.

United States: CBO and OMB projected debt held by the public
Marketable and non-marketable debt

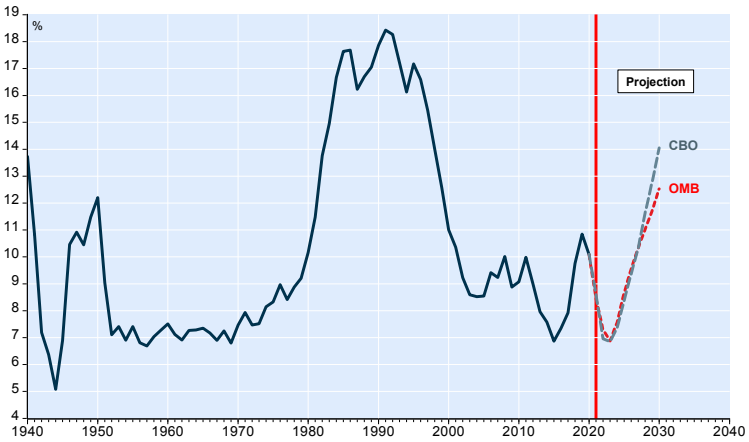


NBF Economics and Strategy (CBO July 2021 and OMB, May 2021)

The CBO, meanwhile, publishes projections of what the federal budget would be over the 10 years beginning with 2021 if current laws on taxes and spending remain generally unchanged. Its July report, based on laws in place as of May 18, 2021, is intended as a benchmark for use by policymakers assessing the effects of future policy decisions and not as a forecast. It projects that with no change in tax laws, revenues would grow to 17.7% of GDP, two percentage points less than under the president's proposal, and debt held by the public, $33.913 trillion, would be significantly less than in his proposal. Still, with revenues lower, debt service would be more challenging in the CBO projection.

As the chart on the following page illustrates, net interest payments are projected in the president's proposal to reach 12.5% of revenue by 2030, but in July's CBO baseline projection they would by that time reach the 14% threshold referred to above.

Net interest outlay as a percentage of revenue
Data for fiscal years 1940-2020 from St. Louis Fed, CBO and OMB projections after 2020

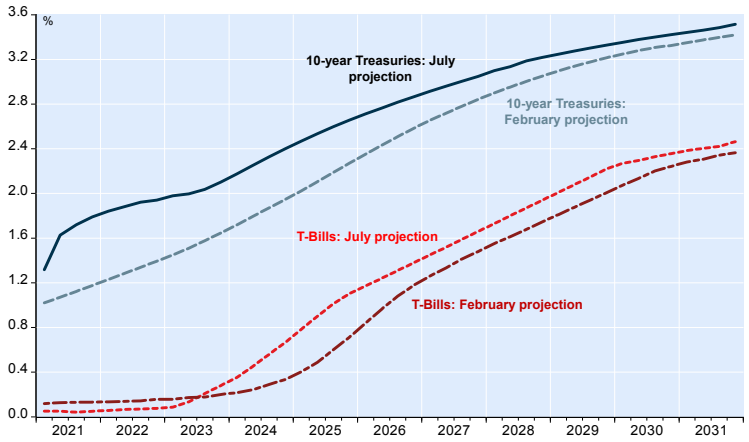


NBF Economics and Strategy (Sources: Fed St-Louis, CBO July 2021 and OMB, May 2021)

Last February, 10-year Treasuries were trading around 1.30%. They peaked at 1.77% in March, fell to 1.13% in early July and closed August 12 at 1.36%. Such wild swings in a matter of months are reminders of Douglas Elmendorf's warning that interest-rate projections are highly uncertain and policymakers should be mindful of the risk.

Another way to take this point is to look at the path of interest rates projected by the CBO over the next 10 years. In its July version, rates are higher than in its February version and while the July projection shows public debt 1.7% larger by 2030, its projection of net interest cost are 16.3% higher than that of the February report.

CBO: Interest-rate projections
February and July projections



NBF Economics and Strategy (CBO)

To evaluate the effect of various interest-rate scenarios on the cost of debt service, we need to use projections of the yield curve over time to calculate the effect of the refinancing requirement for maturing debt as well as the timing and size of net new borrowing requirements. The term structure of outstanding debt will obviously play a role in the outcome.

As of June 30, debt held by the public stood at $22.3 trillion, of which T-bills accounted for 19.1%, notes 54.2%, bonds 14.2%, TIPS 7.2%, FRNs 2.5% and nonmarketable debt 2.8%.

Debt held by the public

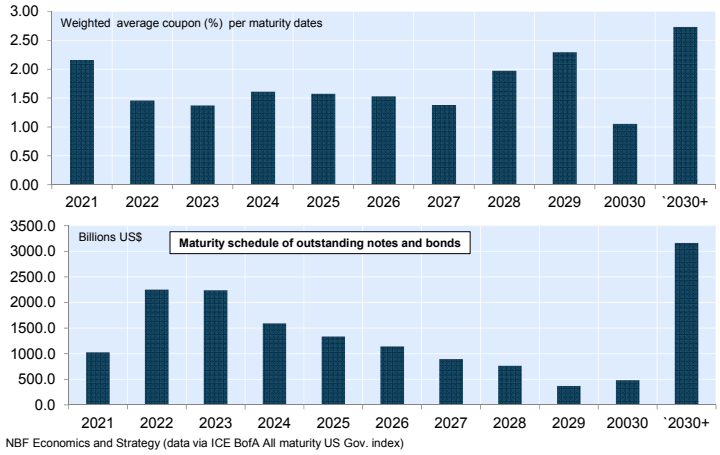
Millions of US$ Marketable debt	6/30/21	Percent of Markatable debt	Percent of toal
Bills	4,273,670	19.7%	19.1%
Notes	12,097,216	55.7%	54.2%
Bonds	3,173,226	14.6%	14.2%
TIPS	1,617,396	7.4%	7.2%
FRN	553,405	2.5%	2.5%
Fed Fin Bank	0.0	0.0%	0.0%
Total markatable	21,714,913	100.0%	97.2%
Non-marketble debt	614,910		2.8%
Total debt held by the public	22,329,823		100.0%

NBF Economics and Strategy (Source: Treasury Direct)

So floating-rate products (T-bills and FRNs) account for 22.2% of marketable debt. Assuming that their weight remains constant over time, it is clear that differences in the paths of short-term rates alone would result in significant differences in debt service cost.

The weighted-average coupon (WAC) of notes and bonds maturing from July through December of this year (based on face values, not market values) is 2.16%, compared to yields to maturity of 2.00% on 30-year bonds and 0.22% on 2-year notes (as of August 12). So if the yield curve were to remain unchanged for the rest of this year, refinancing of maturing debt would likely result in a lower WAC by year end.

Weighted average coupon and maturity distribution of notes and bonds
As of July 15,2021



NBF Economics and Strategy (data via ICE BofA All maturity US Gov. index)

However, the WAC of Treasuries maturing in 2022 and 2023 is relatively low, suggesting that a rapid upward shift of the yield curve in the coming two years could have a significant effect on net interest outlay, given the refinancing requirements of those two years.

A what-if analysis

Judging by the FOMC rate guidance (Summary of Economic Projections: median dot of 0.625% fed funds rate at year end 2023) and the July WAC of notes and bonds outstanding (1.82%), it seems unlikely that the WAC of debt held by the public will be high enough to drive net interest outlay above the 14% threshold in the medium term. As the following table shows, reaching the 14% threshold by 2025 would require a gross coupon of 2.59% on debt held by the public, versus the 1.6% projected by the CBO. Nonetheless, in a post-pandemic era in which inflation could be higher than is assumed in the CBO's baseline projection, the odds

that the U.S. Treasury will face difficult budgeting choices by 2030 or somewhat earlier are non-negligible.

CBO's Baseline Budget Projection
July 2021, in US$ billions

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Debt Held by the Public	21,017	23,012	24,392	25,156	25,959	26,967	28,062	29,185	30,733	32,119	33,913
Revenues	3,421	3,842	4,390	4,597	4,671	4,734	4,984	5,253	5,396	5,572	5,754
Net interest outlays		331	306	315	344	396	467	541	628	712	808
Average coupon on DHBP		1.7	1.4	1.4	1.5	1.6	1.8	2.0	2.2	2.4	2.6
Net effective coupon		1.44	1.25	1.25	1.33	1.47	1.66	1.85	2.04	2.22	2.38
Net int. Outlays /Revenues		8.62	6.97	6.85	7.37	8.37	9.37	10.30	11.64	12.78	14.04
What if											
14% of revenues		538	615	644	654	663	698	735	755	780	806
Needed effective coupon		2.34	2.52	2.56	2.52	2.46	2.49	2.52	2.46	2.43	2.38
Gross coupon		2.60	2.67	2.71	2.69	2.59	2.62	2.67	2.61	2.61	2.59

NBF Economics and Strategy (Source: CBO and author's calculations)

NATIONAL BANK OF CANADA
FINANCIAL MARKETS

Economics and Strategy

Montreal Office
514-879-2529

Stéfane Marion
Chief Economist and Strategist
stefane.marion@nbc.ca

Matthieu Arseneau
Deputy Chief Economist
matthieu.arseneau@nbc.ca

Paul-André Pinsonnault
Senior Economist
paulandre.pinsonnault@nbc.ca

Kyle Dahms
Economist
kyle.dahms@nbc.ca

Daren King
Economist
daren.king@nbc.ca

Jocelyn Paquet
Economist
jocelyn.paquet@nbc.ca

Angelo Katsoras
Geopolitical Analyst
angelo.katsoras@nbc.ca

David Djavidi
Intern Economist
david.djavidi@nbc.ca

Alexandra Ducharme
Intern Economist
alexandra.ducharme@nbc.ca

Toronto Office
416-869-8598

Warren Lovely
Chief Rates and Public Sector Strategist
warren.lovely@nbc.ca

Taylor Schleich
Rates Strategist
taylor.Schleich@nbc.ca

Alpa Atha
Fixed Income Economist
alpa.atha@nbc.ca

UK Residents

This Report is a marketing document. This Report has not been prepared in accordance with EU legal requirements designed to promote the independence of investment research and it is not subject to any prohibition on dealing ahead of the dissemination of investment research. In respect of the distribution of this Report to UK residents, NBF has approved the contents (including, where necessary, for the purposes of Section 21(1) of the Financial Services and Markets Act 2000). This Report is for information purposes only and does not constitute a personal recommendation, or investment, legal or tax advice. NBF and/or its parent and/or any companies within or affiliates of the National Bank of Canada group and/or any of their directors, officers and employees may have or may have had interests or long or short positions in, and may at any time make purchases and/or sales as principal or agent, or may act or may have acted as market maker in the relevant investments or related investments discussed in this Report, or may act or have acted as investment and/or commercial banker with respect hereto. The value of investments, and the income derived from them, can go down as well as up and you may not get back the amount invested. Past performance is not a guide to future performance. If an investment is denominated in a foreign currency, rates of exchange may have an adverse effect on the value of the investment. Investments which are illiquid may be difficult to sell or realise; it may also be difficult to obtain reliable information about their value or the extent of the risks to which they are exposed. Certain transactions, including those involving futures, swaps, and other derivatives, give rise to substantial risk and are not suitable for all investors. The investments contained in this Report are not available to retail customers and this Report is not for distribution to retail clients (within the meaning of the rules of the Financial Conduct Authority). Persons who are retail clients should not act or rely upon the information in this Report. This Report does not constitute or form part of any offer for sale or subscription of or solicitation of any offer to buy or subscribe for the securities described herein nor shall it or any part of it form the basis of or be relied on in connection with any contract or commitment whatsoever.

This information is only for distribution to Eligible Counterparties and Professional Clients in the United Kingdom within the meaning of the rules of the Financial Conduct Authority. NBF is authorised and regulated by the Financial Conduct Authority and has its registered office at 70 St. Mary Axe, London, EC3A 8BE.

NBF is not authorised by the Prudential Regulation Authority and the Financial Conduct Authority to accept deposits in the United Kingdom.

U.S. Residents

With respect to the distribution of this report in the United States of America, National Bank of Canada Financial Inc. ("NBCFI") which is regulated by the Financial Industry Regulatory Authority (FINRA) and a member of the Securities Investor Protection Corporation (SIPC), an affiliate of NBF, accepts responsibility for its contents, subject to any terms set out above. To make further inquiry related to this report, or to effect any transaction, United States residents should contact their NBCFI registered representative.

This report is not a research report and is intended for Major U.S. Institutional Investors only.

This report is not subject to U.S. independence and disclosure standards applicable to research reports.

HK Residents

With respect to the distribution of this report in Hong Kong by NBC Financial Markets Asia Limited ("NBCFMA")which is licensed by the Securities and Futures Commission ("SFC") to conduct Type 1 (dealing in securities) and Type 3 (leveraged foreign exchange trading) regulated activities, the contents of this report are solely for informational purposes. It has not been approved by, reviewed by, verified by or filed with any regulator in Hong Kong. Nothing herein is a recommendation, advice, offer or solicitation to buy or sell a product or service, nor an official confirmation of any transaction. None of the products issuers, NBCFMA or its affiliates or other persons or entities named herein are obliged to notify you of changes to any information and none of the foregoing assume any loss suffered by you in reliance of such information.

The content of this report may contain information about investment products which are not authorized by SFC for offering to the public in Hong Kong and such information will only be available to, those persons who are Professional Investors (as defined in the Securities and Futures Ordinance of Hong Kong ("SFO")). If you are in any doubt as to your status you should consult a financial adviser or contact us. This material is not meant to be marketing materials and is not intended for public distribution. Please note that neither this material nor the product referred to is authorized for sale by SFC. Please refer to product prospectus for full details.

There may be conflicts of interest relating to NBCFMA or its affiliates' businesses. These activities and interests include potential multiple advisory, transactional and financial and other interests in securities and instruments that may be purchased or sold by NBCFMA or its affiliates, or in other investment vehicles which are managed by NBCFMA or its affiliates that may purchase or sell such securities and instruments.

No other entity within the National Bank of Canada group, including National Bank of Canada and National Bank Financial Inc, is licensed or registered with the SFC. Accordingly, such entities and their employees are not permitted and do not intend to: (i) carry on a business in any regulated activity in Hong Kong; (ii) hold themselves out as carrying on a business in any regulated activity in Hong Kong; or (iii) actively market their services to the Hong Kong public.

Copyright