Convenience Lost*

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Abstract

We show that long-term Treasury's convenience yields are substantially more sensitive to changes in Treasury supply than short-term Treasury's convenience yields. The fiscal expansion in the past two decades and the resultant increase in Treasury supply depressed convenience yields heterogeneously across maturities — driving them to zero for short-term Treasurys and into negative territory for long-term Treasurys. As a result, the seigniorage revenue earned by the U.S. for issuing safe and liquid assets declined. Although the U.S. Treasury shortened its debt maturity structure in recent years, we show this adjustment is unable to fully offset the negative effect of debt quantity increase nor recover the seigniorage revenue that the U.S. historically earned.

Keywords: Convenience Yield, Seigniorage Revenue, Fiscal Capacity

*November 2024. We thank Viral Acharya and Tom Laarits for helpful comments and suggestions. Myeongrok Doh provided excellent research assistance. The views in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or any other person associated with the Federal Reserve System.

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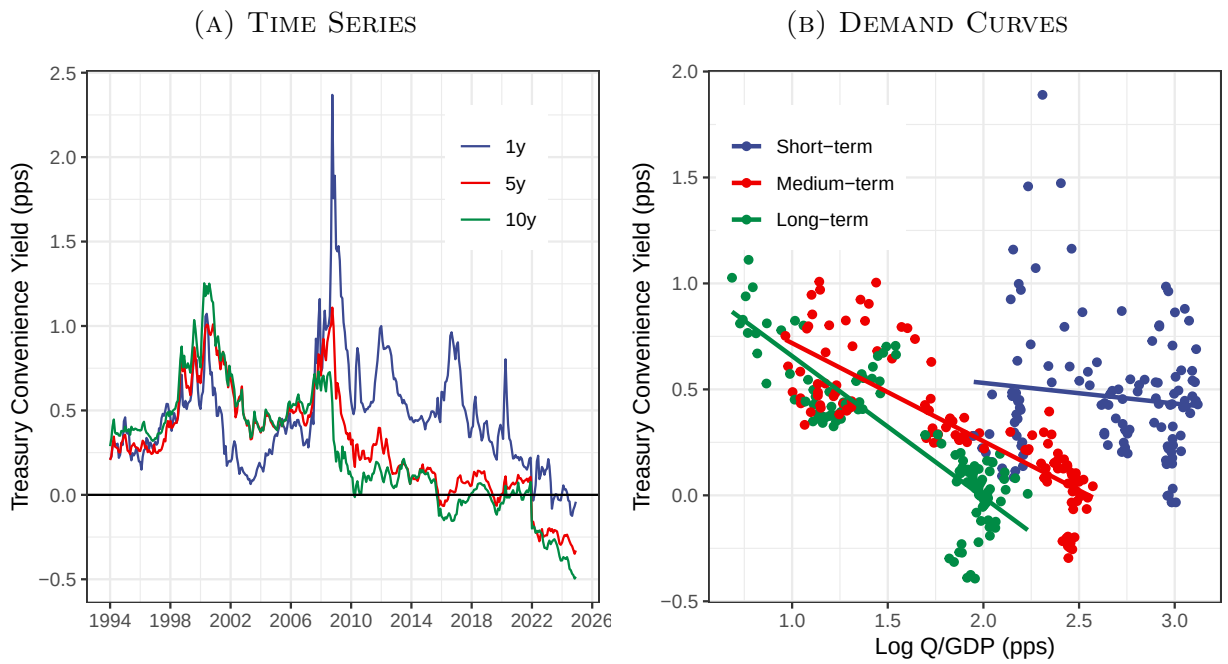
The United States government enjoys a unique position in global financial markets due to its debt being the world's primary reserve asset. This status has historically allowed the U.S. to issue public debt at lower interest rates than other countries, which has been deemed an *exorbitant privilege*. Investors are willing to pay a *convenience yield* to hold onto Treasurys due to their safety, liquidity, and regulatory advantages. As a result, the U.S. government borrows relatively cheaply and earns seigniorage – the implicit income from issuing debt at below-market interest rates. However, recent developments in the U.S. fiscal condition and global financial markets have raised concerns about the sustainability of its privilege as the supplier of reserve assets. The U.S. public debt has increased from 30% of GDP in 2000 to around 100% of GDP today. Is the U.S. privilege from supplying reserve assets as large as it used to be? And will the U.S. continue to enjoy this privilege in the future?

This paper contributes to this critical discussion by documenting new insights into the relationship between U.S. government debt level, debt maturity structure, and bond convenience yields. We show that the fiscal expansion in the U.S. over the past two decades, which led to a significant increase in Treasury supply, has substantially eroded the convenience yields that have long benefited the U.S. economy.

We begin with two empirical observations. First, convenience yields on U.S. Treasurys have declined markedly in recent years, turning negative across several maturities. Figure 1(A) illustrates the temporal evolution of convenience yields for U.S. Treasurys across different maturities. Our primary measure of convenience yields is the difference between the maturity-matched Overnight Index Swap (OIS) rate and the Treasury yield, as the OIS rate is typically considered a near risk-free rate devoid of liquidity premiums. By comparing Treasury yields with maturity-matched OIS rates, we isolate the convenience yield — the spread that captures the extra return investors forego for the benefits of holding Treasurys.

Our second observation is that the convenience yield on long-term Treasury debt has had much more pronounced declines than short-term debt. Figure 1(A) shows significant variations across maturities: at the end of our sample, the 1-year Treasury convenience yield

FIGURE 1
TREASURY CONVENIENCE YIELDS BY MATURITY



is close to 0%, while the 10-year Treasury convenience yield is around −0.4%.

These two observations prompt a natural question: How does the variation in bond convenience yields across maturities relate to the quantity of U.S. Treasurys outstanding? Figure 1(B) shows that convenience yield differentials are systematically linked to the quantities of U.S. debt outstanding. This figure plots the convenience yield for three different maturity buckets against the log of the quantity of outstanding debt of that maturity, normalized by GDP. We also plot the best-fitting linear line for each maturity bucket, which illustrates that the demand curve for long-term debt is steeper than that for short-term debt. Hence, convenience yields on long-term debt appear to be more sensitive to increases in the quantity of long-term debt outstanding. Over the past two decades, the U.S. government has significantly increased its outstanding stock of debt across all maturity buckets, which has heterogeneous effects on convenience yields across maturities.

Understanding the relationship between Treasury supply and convenience yields is cru-

cial, because convenience yields directly impact the seigniorage revenue earned by the U.S. government. Seigniorage revenue represents the financial advantage gained by issuing debt at interest rates lower than those demanded by investors for holding risk-free assets without the liquidity and safety benefits of Treasurys. A decline in convenience yields, especially when they turn negative, implies that the U.S. is paying a premium rather than earning one, thereby reducing or even reversing the seigniorage revenue.

However, establishing a causal link between Treasury supply and convenience yields is challenging due to potential endogeneity. For instance, the U.S. government might choose to issue more debt when the market demand for Treasurys is high. Moreover, economic and financial conditions might simultaneously affect both debt issuance and convenience yields. To address this endogeneity issue, we employ an instrumental variables approach to identify the slopes of the demand curves. Specifically, we exploit exogenous variations in tax revenues, following the methodology of Romer and Romer (2010) and extended by Jiang and Richmond (2024). This strategy allows us to isolate the impact of Treasury supply on convenience yields by instrumenting debt issuance with fiscal shocks that are unrelated to current economic conditions.

Our instrumental variable regression estimates confirm that increases in Treasury supply causally lead to declines in convenience yields, with a more substantial impact on long-term debt. Specifically, a 5 percentage point increase in the long-term debt-to-GDP ratio results in a 0.74 percentage point decline in the long-term convenience yield. In contrast, the convenience yield on short-term Treasurys is relatively insensitive to changes in supply, remaining close to zero even as debt levels rise.

In addition to OIS-based convenience yields, we also examine Treasury-based Covered Interest Parity (CIP) deviations, known as the Treasury basis. The Treasury basis measures the relative convenience of U.S. Treasurys compared to sovereign debt of other developed countries by capturing the premium investors are willing to pay for U.S. Treasurys over hedged foreign government bonds. Du et al. (2018) shows that the Treasury basis has also

declined over time, particularly at longer maturities. We estimate the extent to which this decline in the Treasury basis was driven by changes in supply. Our results reinforce the notion that the U.S. is losing its unique position in providing safe and liquid assets as a result of increased borrowing.

Our findings have significant implications for U.S. fiscal sustainability and optimal debt management. We show the total seigniorage revenue earned from Treasury convenience yields has declined over the past two decades, with majority of this declined explained by the increase in Treasury supply. The U.S. Treasury has adjusted the maturity of issuances toward short-term debt in recent years, perhaps to mitigate the decline in convenience yields for long-term debt. However, this shift has had limited effect because even short-term convenience yields have declined to around zero. This indicates that the U.S. government's ability to earn seigniorage from issuing safe and liquid assets is substantially lower than in the past.

Our results showing heterogeneity in demand elasticities across maturities shows that the impact of public debt expansion on bond premiums depends crucially on the maturity choice, which creates a challenging trade-off for the U.S. Treasury — while the flatter demand curve for short-term debt suggests room for additional issuance, increased reliance on short-term funding heightens roll-over risks in an environment of historically high debt levels. The results also raise questions about the international role of U.S. Treasuries, as declining convenience yields on long-term debt may themselves be a signal of diminished demand for U.S. Treasurys from various investor types.

Finally, our findings highlight how the heterogeneous demand curves interact with different monetary policy instruments. For example, quantitative easing operates along steeper long-term demand curves and may have larger effects on convenience yields compared to conventional policy focused on short-term markets. The results also inform theoretical models of Treasury markets by emphasizing the importance of incorporating maturity-dependent demand elasticities, whether through preferred habitat investors with maturity-specific pref-

erences or through heterogeneous investor types operating in different maturity segments.

Related Literature. Our paper contributes to a large literature studying Treasury demand (Krishnamurthy and Vissing-Jorgensen 2012; Nagel 2016; Choi, Kirpalani, and Perez 2022; Fang, Hardy, and Lewis 2022; Krishnamurthy and Li 2023; Jansen, Li, and Schmid 2024; Acharya and Laarits 2023). While these earlier works focus on the aggregate Treasury portfolio, we show interesting heterogeneity in demand elasticity across maturities, and argue that this is a key factor for understanding the variations in U.S. seigniorage revenues.

Moreover, using Treasury CIP basis as a measure of U.S. Treasury's premium relative to foreign government debt, Du, Im, and Schreger (2018) document a decline in this premium after the Global Financial Crisis, particularly at longer maturities. Joslin, Li, and Song (2021) measure the term structure of liquidity premiums on U.S. Treasurys using the Treasury-Refcorp bond spread. We add to this literature by extending the methodology in Romer and Romer (2010) to identify the slopes of demand curves, and documenting heterogeneity in these slopes across maturities.[1]

Our paper is also related to works on the "inconvenience yield" of U.S. Treasurys in recent years (Duffie 2020; He, Nagel, and Song 2022; Ma, Xiao, and Zeng 2022). These works focus largely on the microstructure mechanisms. For example, Du, Hébert, and Li (2023) show that dealers switched from net short to net long in the Treasury market, which increased the premium they require to hold Treasurys. Our paper complements these works by providing a macroeconomic perspective: the underlying increase in Treasury supply is a key driver of the decline in convenience yields, and led long-term Treasurys to lose more premia than short-term Treasurys, which is responsible for negative seigniorage revenues in recent years.

Our paper also contributes to our understanding of the U.S. exorbitant privilege (Gourinchas and Rey 2007; Curcuru, Dvorak, and Warnock 2008; Chernov, Schmid, and Schneider

[1] Wiegand (2024) constructs a measure of high-frequency fiscal policy shocks and studies their impact on asset prices, and finds a negative relation between increases in fiscal spending shocks and measures of convenience yields, even at high frequencies.

2020; Gourinchas and Rey 2022; Atkeson, Heathcote, and Perri 2022; Jiang, Richmond, and Zhang 2024c; Jiang, Lustig, Van Nieuwerburgh, and Xiaolan 2024b; Jiang 2024). While the U.S. has been benefiting from issuing debt at lower interest rates, our evidence indicates that this advantage is increasingly limited to short-term debt, with negative yields on long-term debt signaling potential limits to the global market's capacity to absorb U.S. debt.

Finally, in terms of optimal debt management, Greenwood et al. (2015) study the trade-off between the liquidity benefits of short-term debt and the refinancing risk associated with frequent roll-overs. Relatedly, Farhi and Maggiori (2018) revisit the "Triffin dilemma," arguing that global demand for safe assets encourages the U.S. to supply them, potentially at the cost of fiscal sustainability. Our findings align with this trade-off: as the U.S. government issues more short-term debt to exploit favorable convenience yields, this may increase its exposure to roll-over risk as debt level rises. The maturity-specific demand curves from our estimate provides a quantitatively important consideration for the U.S. Treasury's optimal debt management strategy (Bhandari et al. 2017; Jiang et al. 2020).

1 Data and Empirical Strategy

Our empirical strategy aims to quantify the relationship between debt quantities and the convenience yields of Treasury assets relative to alternative risk-free assets. We begin by describing the data used in our analysis. Afterwards, we discuss potential endogeneity concerns and how we address these concerns through an instrumental variables approach.

We construct a comprehensive dataset capturing U.S. government debt outstanding across multiple maturity with their corresponding convenience yields. We obtain from CRSP the market value of all Treasury bonds and notes within three maturity buckets: less than 3 years, 3–6 years, and 6–15 years. We label these maturity buckets short-term, medium-term and long-term, respectively. We exclude Treasury bills, callable bonds, inflation-adjusted bonds, and we use the quantity of debt that is publicly held, which excludes Fed holdings.

We calcuate the convenience yield as the spread between maturity-matched OIS rates and Treasury yields:

$$cy_{h,t} = y_{h,t}^{OIS} - y_{h,t}^{Govt}.$$

We obtain OIS rates from Bloomberg and Treasury yields from FRED. We associate the 1-year convenience yield with short-term Treasurys, the 5-year convenience yield with medium-term Treasurys, and the 10-year convenience yield with long-term Treasurys. Our analysis is conducted at the quarterly frequency.

We also evaluate investor preferences for Treasurys relative to sovereign bonds issued by other advanced economies. We compute the Treasury basis against all G-10 currencies using sovereign bond yields, forward exchange rate, spot exchange rate, and cross-currency bases data from Bloomberg.[2] We describe our procedure for computing the Treasury basis in Section 2.2.

The key empirical challenge is that debt issuance decisions may be endogenous to market conditions and convenience yields. For example, the U.S. government may borrow more when convenience yields are high. To address this endogeneity concern, we employ an instrumental variables approach that identifies exogenous changes in the supply of Treasurys originating from fiscal policy shocks. We obtain a time-series of fiscal policy shocks from Jiang and Richmond (2024), which extends the narrative approach of Romer and Romer (2010) to identify shocks from 1980 to 2023.

Romer and Romer (2010) use narrative records such as presidential speeches, executive-branch documents, and Congressional reports to categorize fiscal shocks into four groups: (1) endogenous countercyclical policies to return growth to normal, (2) endogenous policies motivated by spending changes, (3) exogenous policies to deal with an inherited budget deficit, and (4) exogenous policies motivated by a desire to raise long-run growth. We

[2]The G-10 currencies are the Australian dollar, Canadian dollar, Swiss franc, Danish kroner, Euro, British pound, Japanese yen, Norwegian kroner, New Zealand dollar, and Swedish kroner.

are interested in shocks to U.S. fiscal policy that are unrelated to global macroeconomic conditions. Thus, we use shocks from category (4), which we believe are the most likely to satisfy our exclusion restriction. As Romer and Romer (2010) note, a very common reason for tax cut under this category is one in which policymakers say that the economy is doing fine (output is growing normally), but they want output to grow faster than normal. This category also includes tax cuts for philosophical reasons, such as to shrink the size of government or for fairness.

2 Empirical Results

2.1 Impact of Treasury Supply on Convenience Yields

Our analysis of Treasury convenience yields proceeds in two steps. First, we examine the relationship between year-over-year changes in convenience yields and year-over-year changes in the supply of Treasurys within each maturity bucket described above. Following Krishnamurthy and Vissing-Jorgensen (2012), our baseline specification regresses convenience yields on the natural logarithm of the market value of debt normalized by GDP. Afterwards, we implement our instrumental variables strategy to establish causality.

Our regression equation is

$$\Delta cy_{h,t} = \alpha_h + \beta_h \Delta \log \frac{D_{h,t}}{GDP_t} + \gamma_h 1_{t \geq 2008} + \varepsilon_{h,t}, \tag{1}$$

where the change operator Δ computes year-on-year growth rates within our quarterly sample: $\Delta x_t = x_t - x_{t-4}$. The coefficient β_h captures the sensitivity of the convenience yield to changes in the supply of Treasurys available within a given maturity bucket. We also include an indicator variable $1_{t \geq 2008}$ to account for the structural break in the debt dynamics following the Global Financial Crisis. Moreover, we remove the NBER recession quarters (2007Q4–2009Q2 and 2019Q1–2020Q2) from our sample because the convenience yield move-

Table 1
Impact of Treasury Supply on Convenience Yields by Maturity

	Short-term ($\leq$ 3Y)	Medium-term (3Y–6Y)	Long-term (6Y–15Y)
Panel A: Ordinary Least-Squares			
Δ Log Debt/GDP	-0.41	-0.53***	-0.61***
	(0.47)	(0.16)	(0.21)
Post-2008	-0.04	-0.03	-0.08
	(0.06)	(0.06)	(0.06)
Observations	98	98	98
R^2	0.07	0.19	0.23
Panel B: Instrumental Variables			
Δ Log Debt/GDP	0.12	-0.99**	-1.23***
	(0.44)	(0.46)	(0.37)
Post-2008	-0.10	0.02	-0.08
	(0.10)	(0.10)	(0.06)
Observations	98	98	98
R^2	0.01	0.09	0.03
F-test (1st stage)	9.87	12.91	8.91

Notes: This table presents regression results from estimating equation (1) with 4-quarter changes in the convenience yield on the left-hand side. Our sample benchmark sample runs from 1997Q1 to 2026Q2, excluding NBER recession periods. Newey-West standard errors with 8 lags are presented in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

ments in these periods are largely driven by the crises which our supply-side instrument does not capture.

Table 1 describes the impact of changes in Treasury supply on convenience yields within maturity buckets. The first panel presents the ordinary least squares (OLS) results. Consistent with Figure 1, we find that the convenience yield on medium and long-term Treasurys tend to decline as Treasury supply increases. The point estimate of -0.61 on long-term Treasurys indicates that a 10 percentage point increase in the log long-term debt-to-GDP ratio is associated with a 6 basis point decline in the convenience yield on long-term Treasurys. In contrast, changes in the supply of short-term Treasurys are not associated with a significant change in the convenience yield on these financial assets.

Panel B of Table 1 presents the results of our instrument variables specification and establishes a causal link between Treasury supply and the convenience yield on Treasurys. We instrument changes in the log debt-to-GDP ratio with the fiscal shocks from Jiang and Richmond (2024). Similar to the least-squares specification, we find that increases in the supply of medium and long-term Treasurys decrease the convenience yield on medium and long-term Treasurys. On the other hand, changes in the supply of short-term Treasurys do not significantly impact the short-term convenience yield.

The point estimate of -1.23 on long-term Treasurys indicates that a 10 percentage point increase in log long-term debt-to-GDP results in a 12 basis point decline in the convenience yield on long-term Treasurys. A point estimate of -0.99 on medium-term Treasurys indicates that a 10 percentage point increase in log medium-term debt-to-GDP from its mean results in a 10 basis point decline in the convenience yield on medium-term Treasurys.

2.2 Impact of Treasury Supply on the Treasury Basis

An alternative measure of the liquidity and safety benefits from holding Treasurys is the Treasury basis. The Treasury basis measures the difference between the convenience yield of U.S. government bonds and those of government bonds of other developed countries. In this section, we estimate the effect of changes in the supply of Treasurys on Treasury basis within each maturity bucket.

Du et al. (2018) show that the Treasury basis relative to a foreign country i is the deviation from covered interest rate parity between government bond yields in the United States and country i:

$$\Phi_{i,n,t} = \underbrace{y^{Govt}_{i,n,t} - f_{i,n,t} + s_{i,t}}_{\text{synthetic dollar bond}} - y^{Govt}_{USD,n,t}, \tag{2}$$

where $f_{i,n,t}$ is the forward rate for hedging currency i against the dollar over a period of n-years, and $s_{i,t}$ is the spot exchange rate. The first three terms on the left-hand side of equation (2) sum up to the yield on a synthetic dollar bond. Investors who hold the synthetic

dollar bond receive cashflows in dollars, but physically hold onto a foreign government bond for the duration of the investment. The final term in equation (2) is the yield on the U.S. Treasury bond.

The difference in yields between the synthetic dollar bond and the U.S. Treasury bond captures the liquidity and safety benefits of physically holding onto a U.S. Treasury security as opposed to the government bond of another country. An increase in the Treasury basis, $\Phi_{i,n,t}$, indicates an increase in the convenience benefits of the U.S. Treasury, because the foreign government must compensate investors more for holding onto its bond.

Du et al. (2018) show that the U.S. Treasury basis has declined over time, particularly at longer maturities. We replicate these results using our sample in Appendix Figure A.1 and confirm that the Treasury basis has declined over our sample period. Not only are U.S. Treasurys losing their convenience over time, but Treasurys are also losing their convenience relative to foreign government bonds. Du et al. (2018) also show that the Treasury basis exhibits an inverse relationship with the aggregate supply of Treasurys. Panel B of Appendix Figure A.1 shows that the Treasury basis exhibits an inverse relationship with the supply of Treasurys within each maturity bucket as well. Similar to the demand curves presented with convenience yields on the y-axis, the inverse relationship between Treasury basis and supply appears steeper for longer-maturity bonds.

Table 2 estimates the impact of changes in Treasury supply on the Treasury basis. We regress changes in the Treasury basis on changes in the log U.S. debt-to-GDP ratio by maturity bucket. We instrument changes in the log U.S. debt-to-GDP ratio with our fiscal policy shocks that we used in the prior section. We find that increases in the supply of medium and long-term Treasurys decrease the average Treasury basis on medium and long-term Treasurys. On the other hand, changes in the supply of short-term Treasurys do not significantly impact the short-term convenience yield.

The point estimate of -0.83 on long-term Treasurys indicates that a 5 percentage point increase in long-term debt-to-GDP from its mean results in a 0.54 percentage point decline in

TABLE 2
IMPACT OF TREASURY SUPPLY ON THE TREASURY BASIS BY MATURITY

	Short-term ($\leq$ 3Y)	Medium-term (3Y–6Y)	Long-term (6Y–15Y)
Panel A: Ordinary Least-Squares			
Δ Log Debt/GDP	-0.01	-0.18	-0.36***
	(0.24)	(0.15)	(0.12)
Post-2008	0.01	-0.03	-0.04*
	(0.05)	(0.04)	(0.03)
Observations	97	97	97
R^2	0.00	0.05	0.20
Panel B: Instrumental Variables			
Δ Log Debt/GDP	-0.31	-0.81**	-0.83***
	(0.48)	(0.36)	(0.17)
Post-2008	0.04	0.05	-0.05*
	(0.09)	(0.07)	(0.03)
Observations	97	97	97
R^2	-0.02	-0.29	-0.08
F-test (1st stage)	12.93	13.17	9.50

Notes: This table presents regression results from estimating equation (1) with 4-quarter changes in the Treasury basis on the left-hand side. Our sample benchmark sample runs from 1997Q1 to 2024Q1, excluding 2009 and 2020. Newey-West standard errors with 8 lags are presented in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

the long-term Treasury basis. A point estimate of -0.97 on medium-term Treasurys indicates that a 5 percentage point increase in medium-term debt-to-GDP from its mean results in a 0.41 percentage point decline in the medium-term Treasury basis.

2.3 Aggregate Effects

In the prior section, we showed that increases in Treasury supply decreased the convenience yield of Treasury securities relative to domestic and foreign benchmarks across maturity buckets. Between 2000 and 2024, the debt-to-GDP ratio increased from 56 percent to 123 percent of GDP. How much of an impact did this doubling of the U.S. debt-to-GDP ratio have on the seigniorage revenue earned by the U.S. government?

In this section, we quantify the aggregate effects of Treasury issuance on the seigniorage revenue earned by the U.S. for issuing safe and liquid financial securities. This is the total revenue that investors are willing to pay the U.S. government in order to hold Treasury securities. Following Jiang et al. (2024a), we estimate the U.S. government's seigniorage revenue at each date t by taking the market value weighted sum of convenience yields on each maturity bucket:

$$\mathcal{S}_t = \sum_h cy_{h,t} D_{h,t}, \tag{3}$$

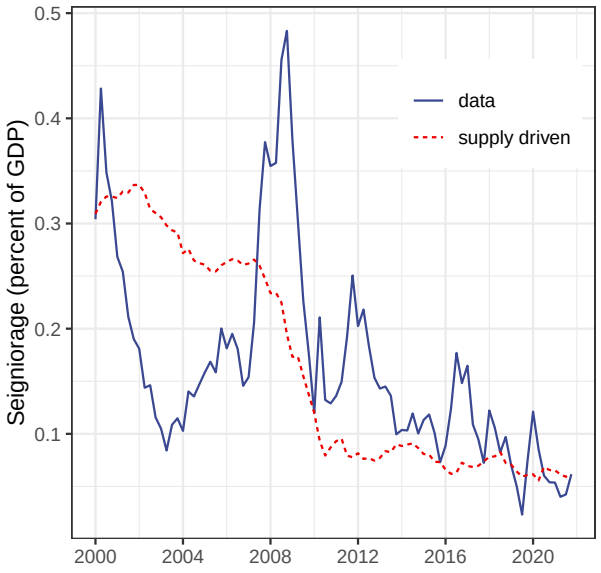
where $\mathcal{S}_t$ represents the seigniorage revenue, h indexes maturity buckets, $cy_{h,t}$ is the convenience yield for maturity bucket h, and $D_{h,t}$ is the market value of debt within that maturity bucket.

Our calculation of seigniorage revenue relies on a key simplifying assumption. Specifically, we assume that the convenience yield on the marginal Treasury security is equal to the average convenience yield earned on all Treasury securities within each maturity bucket. This is equivalent to assuming that the government buys back and reissues all Treasury securities each period at prevailing market prices and convenience yields, which allows us to apply the current period's convenience yield to the entire stock of outstanding debt. While this abstracts from some real-world complexities in Treasury issuance and trading, it provides a tractable framework for estimating the aggregate seigniorage benefits. The resulting estimates represent annualized figures that capture the hypothetical revenue the government would earn if it could reissue its entire debt stock each year at current market conditions.

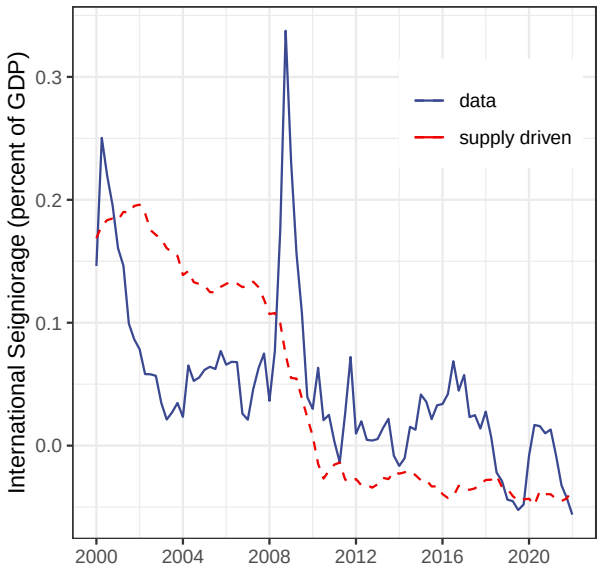
The solid blue line in Panel A of Figure 2 presents the time series of the seigniorage revenue on Treasurys from 1997 to 2024. In general, we observe that the seigniorage revenue has declined over time. It reached a peak in the second quarter of 2000 at 0.14 percent of GDP, and then declined to a trough of -0.12 percent of GDP in the third quarter of 2019. The variation in the seigniorage revenue is notable when compared to the U.S. debt interest cost burden, which has varied between 1.2 to 2.8 percent of GDP in this same time period.

FIGURE 2
IMPACT OF SUPPLY ON TREASURY CONVENIENCE

(A) SEIGNIORAGE



(B) INTERNATIONAL SEIGNIORAGE



The dashed red line in Panel A of Figure 2 computes the counterfactual seigniorage revenue from Treasury convenience if variation in seigniorage revenue was solely driven by changes in Treasury supply. To compute the red dashed line, we take the convenience yields and Treasury supply in 2010 as our starting point and compute counterfactual convenience yields for each period using the estimates in Table 1:

$$\widehat{cy}_{h,t} = cy_{h,2010} + \widehat{\beta}_h \left(\log \frac{D_{h,t}}{GDP_t} - \log \frac{D_{h,2010}}{GDP_{2010}} \right), \tag{4}$$

where $\widehat{\beta}_h$ is the coefficient on $\Delta \log \frac{D_{h,t}}{GDP_t}$ from the IV estimation. After estimating these counterfactual convenience yields for each time period, we apply equation (3) to compute the "supply driven" seigniorage revenue.

Figure 2 shows that changes in Treasury supply explains the majority of the decline in the seigniorage earned from Treasury convenience. In 1999, seigniorage averages 0.07 percent of GDP. By 2023, seigniorage had declined by 0.12 percentage points of GDP to -0.05 percent

of GDP. During this same time period, changes in the supply of Treasurys alone account for a decline of 0.10 percentage points of GDP. Thus, we conclude that the majority of the decline in seigniorage can be explained by increasing Treasury supply.

Panel B of Figure 2 carries out a similar analysis for the decline in seigniorage using the Treasury basis. In this exercise, we use the cross-country Treasury basis $\Phi_{i,n,t}$ instead of the Treasury-OIS spread $cy_{h,t}$ to compute the premium on U.S. Treasurys. The solid blue line represents the production between the market value of debt and the Treasury basis, summed across maturity buckets. This value, which we call the "international seigniorage", represents the extra value investors assign to the aggregate supply of U.S. Treasurys in comparison to government debt issued by other advanced economies.

There are two salient features of the time series of the international seigniorage. First, analogous to the seigniorage figure, the total Treasury basis is steadily declining over time. The decline seems especially pronounced after the Covid pandemic. Second, the total Treasury basis does exhibit spikes during periods of global financial distress, such as during the Global Financial Crisis and the Covid pandemic. These spikes indicate that U.S. government debt still maintains its position as a safe haven asset during economic downturns.

The red dashed line in Panel B of Figure 2 presents the counterfactual international seigniorage if variation in the Treasury basis was solely driven by changes in supply. To compute the red dashed line, we take the Treasury basis and Treasury supply in 2010 as our starting point, and we compute counterfactual the Treasury basis for each period using the estimates in Table 2:

$$\widehat{\Phi}_{h,t} = \Phi_{h,2010} + \widehat{\beta}_h \left(\log \frac{D_{h,t}}{GDP_t} - \log \frac{D_{h,2010}}{GDP_{2010}} \right), \tag{5}$$

where $\widehat{\beta}_h$ is the coefficient on $\Delta \log \frac{D_{h,t}}{GDP_t}$. The counterfactual total Treasury basis matches the decline in the total Treasury basis, indicating that the increase in supply largely explains why the Treasury basis has declined.

While we have focused on the role that Treasury supply has in determining convenience yields and Treasury basis, Figure 2 also shows that the value of the liquidity and safety property is much more volatile than what is implied by changes in supply alone. It is likely that there are additional demand shocks, which are particularly salient during crisis episodes, that drive higher frequency variations in the convenience yield and Treasury basis. The key message our exercise highlights is that the supply factor alone can explain the decades-long declining trend in the value of Treasury convenience.

2.4 Implications for Treasury Issuance

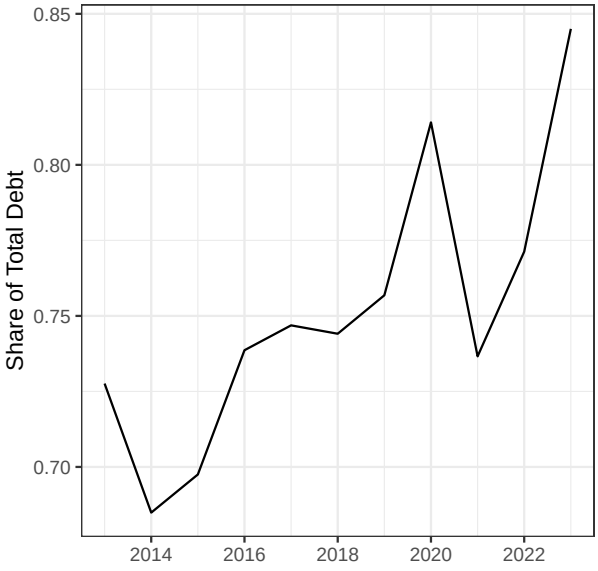
One possible action that the Treasury can take to mitigate the decline in Treasury convenience is to tilt the issuance of Treasurys towards shorter maturities. Using data from Securities Industry and Financial Markets Association, Panel A of Figure 3 shows that this has indeed been happening over the past decade. The market value of Treasury bills as a share of the total debt outstanding has increased from around 70 percent to 85 percent. Did this shift in the maturity structure of Treasurys impact the value of Treasury convenience in the aggregate?

We consider the following exercise to evaluate the impact of the maturity change on seigniorage revenue. In each period, we redistribute the market value of all Treasury securities across maturities such that the share of Treasurys in each maturity bucket matches that of the first quarter of 2010. This exercise assumes that the total amount of borrowing remains constant in each period. We then compute the convenience yield within each maturity bucket that is implied by this fixed maturity distribution according to equation (4). These implied yields capture how the convenience yields on Treasurys would have evolved had the maturity structure of U.S. government debt remained fixed over time.

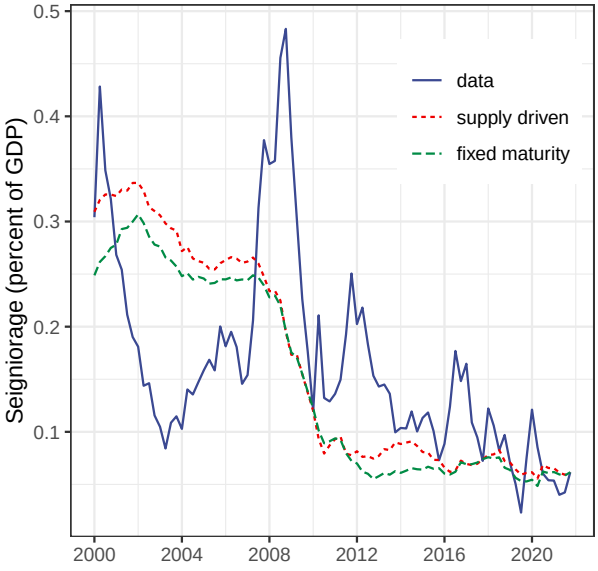
The green dashed line in the Panel B of Figure 3 presents the results of our exercise. The resulting change in seigniorage under a fixed maturity scenario looks very much like the change in seigniorage from the previous section where we allowed both the maturity structure

FIGURE 3
MATURITY SHIFT AND SEIGNIORAGE REVENUE

(A) MARKET VALUE OF BILLS



(B) IMPACT OF MATURITY SHIFT



and the aggregate supply to change over time. Towards the latter part of our sample, the green line lies slightly below the red line and indicates that the shift towards shorter maturities marginally increased convenience yields and seigniorage revenues. However, the impact of the maturity structure on convenience yields is overshadowed by the increase in the total quantity of public debt outstanding.

3 Discussion and Potential Implications

Implications for Optimal Debt Management. Our results help distinguish between two competing narratives about Treasury demand. First, if the demand curves for Treasurys of different maturities have similar slopes, then, the dispersion in convenience yields across maturities reflects heterogeneous demand shocks across the maturity spectrum. These demand shocks, which could be driven by different regulatory requirements, risk and hedging characteristics, or clientele preferences, move the intercept of the demand curve for each

maturity.

Second, if the demand curves have different slopes, then, the dispersion in convenience yields between short-term and long-term Treasurys is a direct reflection of these slopes. Even with similar demand curve intercepts and debt quantities, the convenience yield on short-term Treasurys can still differ from that on long-term Treasurys.

These two scenarios have different implications for the government's debt management strategy. In the first case, as short-term Treasurys also have a downward-sloping demand curve with respect to the debt level, their relative funding advantage as observed in the data can quickly disappear as the government issues more short-term debt. In the second case, the flatter demand curve for short-term Treasurys implies that the government can issue more short-term debt without significantly affecting the convenience yield on short-term Treasurys.

Our empirical analysis favors the second scenario, suggesting some additional fiscal space for the U.S. government to issue more short-term debt. At the same time, the steeper relationship between debt level and long-term Treasury's convenience yield indicates that the market's capacity to absorb additional long-term Treasury may be more constrained than previously thought. This limitation could restrict fiscal space more than analyses based solely on the average interest rate would suggest.

This steeper slope of the long-term demand curve creates a challenging trade-off for debt management. While short-term issuance appears more attractive due to its flatter demand curve and currently higher convenience yields, it exposes the government to substantial roll-over risk. This risk is particularly acute given: (1) the historically high debt-to-GDP ratio, which means larger volumes need to be refinanced, (2) the fact that roll-over needs are concentrated in time, potentially forcing the government to refinance large amounts during potentially adverse market conditions. A sudden shift in market sentiment or liquidity conditions could make it difficult or extremely costly to refinance maturing debt, potentially triggering a fiscal crisis. This scenario becomes more likely as the share of short-term debt

in the total debt stock increases.

International Role of U.S. Treasurys and Reserve Currency Status. Our findings also have implications for the international role of U.S. Treasurys and the U.S. dollar's status as the world's primary reserve currency. The declining convenience yields on long-term Treasurys potentially suggests that the unique advantages of holding U.S. government debt are diminishing, particularly for investors of long-term debt. If the U.S. government's capacity to issue long-term debt without eroding the convenience yield is limited, international investors may seek alternative safe assets to meet their long-term investment needs. This shift could reduce global demand for U.S. Treasurys, potentially impacting the U.S. dollar's dominance in international finance and the benefits that accrue to the U.S. from its reserve currency status.

Implications for the Interaction between Monetary Policy and Fiscal Condition. The differing slopes of Treasury demand curves across maturities have important implications for how monetary policy interacts with convenience yields and the resultant seigniorage revenue. When the Federal Reserve conducts quantitative easing, its purchases of long-term Treasurys operate along a steeper demand curve, potentially creating larger effects on seigniorage revenue. In contrast, conventional monetary policy operations focused on short-term debt markets interact with the flatter demand curve, leading to more modest effects on convenience yields for a given amount of intervention. This asymmetry means that different monetary policy tools can have substantially different indirect effects on the government's seigniorage revenue through their impact on convenience yields across the maturity spectrum. For example, as the Fed is currently going through a tightening cycle, selling Treasurys may further lower bond convenience yields, especially for long-term Treasurys.

Moreover, given the fact that the Fed has already accumulated a Treasury portfolio with varying maturities, additional purchases of long-term Treasurys offset by sales of short-term Treasurys can significantly modify the level and the distribution of bond convenience yields,

even when this operation does not change the total amount of Treasurys held by the Fed.

Implications for Models of Treasury Demand. Our results also shed light on the key dimensions of heterogeneity that models of Treasury demand need to capture. The preferred habitat model, an important workhorse model in this field, studies the dynamic interaction between arbitrageurs who maximize risk-adjusted returns from trading in the Treasury market, and preferred-habitat investors who have downward-sloping demand curves for Treasurys of different maturities. The model focuses on how the intercepts of preferred-habitat investors' demand curves vary across bond maturities and over time, which capture demand shocks in this market.

Our results highlight the heterogeneity in the slopes of aggregate demand curves across maturities. Conceptually, this heterogeneity can arise from two sources. First, the preferred-habitat investors with different maturity profiles may have different slopes in their demand curves, in addition to different intercepts. Second, the arbitrageurs may also perceive different risk and liquidity differences across maturities, leading to different slopes in their demand curves. Either mechanism is interesting to us, as they shed light on possible ways to enrich the preferred habitat model and better understand the dynamics of Treasury convenience yields.

More recently, the literature has been focusing on the heterogeneity in Treasury demand elasticity across investor types (Jiang et al. 2022; Fang et al. 2022; Jansen et al. 2024). Our results suggest that the heterogeneity in demand elasticity may also vary across maturities, and the two types of heterogeneity may interact in an interesting way. For example, it is worth exploring whether the difference in demand elasticity across maturities is driven by different types of investors who trade in different maturity habitats, or by the same type of investors who have different preferences for different maturities.

4 Conclusion

Our findings underscore the evolving nature of the U.S. dollar's role in the global financial system. As convenience yields turn negative and exhibit greater maturity dependence, the traditional view of U.S. debt as a uniquely safe and liquid asset may need to be reassessed.

Future research should explore the implications of these findings for international capital flows, exchange rates, and the potential emergence of alternative reserve assets. Additionally, further work is needed to understand the implications of negative, maturity-dependent convenience yields for optimal monetary and fiscal policy coordination in the world's largest economy and issuer of the primary reserve currency.

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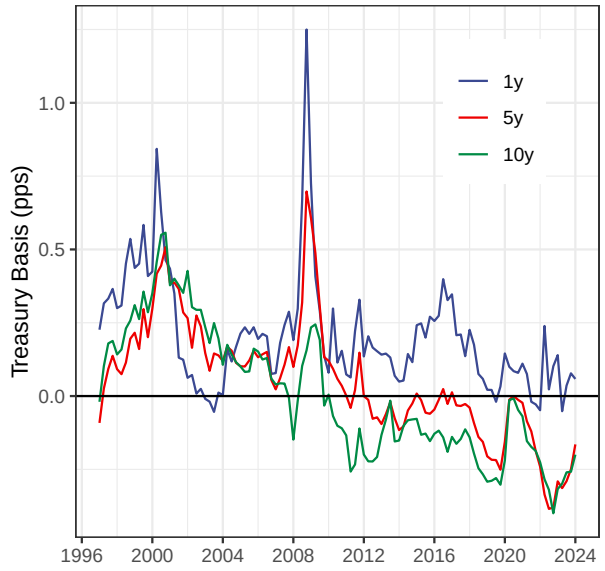
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Appendix

A Additional Tables and Figures

Figure A.1
The U.S. Treasury Basis by Maturity

(a) Time Series



(b) Demand Curves

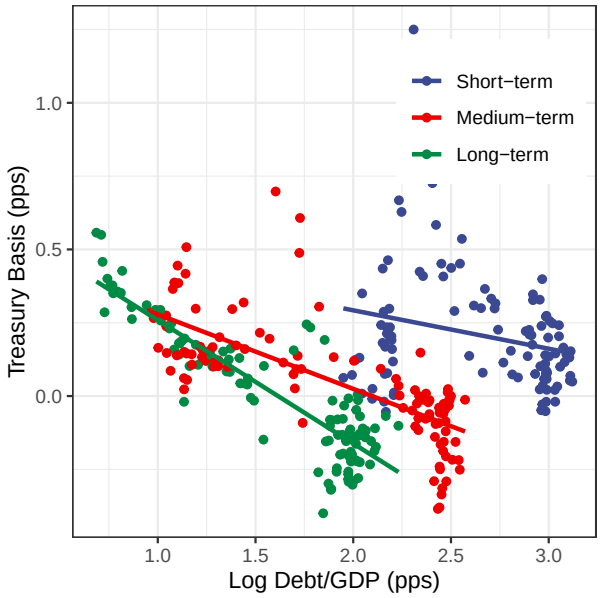


TABLE A.1
IMPACT OF TREASURY SUPPLY ON CONVENIENCE YIELDS BY MATURITY, USING BOOK VALUE

	Short-term ($\leq$ 3Y)	Medium-term (3Y–6Y)	Long-term (6Y–15Y)
Panel A: Ordinary Least-Squares			
Δ Log Debt/GDP	-0.16	-0.38**	-0.59***
	(0.45)	(0.19)	(0.16)
Post-2008	-0.07	-0.04	-0.06
	(0.05)	(0.06)	(0.07)
Observations	98	98	98
R^2	0.04	0.13	0.21
Panel B: Instrumental Variables			
Δ Log Debt/GDP	0.12	-1.30	-1.40*
	(0.42)	(0.91)	(0.74)
Post-2008 Dummy	-0.10	0.07	-0.05
	(0.09)	(0.18)	(0.08)
Observations	98	98	98
R^2	0.02	-0.30	-0.13
F-test (1st stage)	9.03	6.67	6.81

Notes: This table presents regression results from estimating equation (1) with 4-quarter changes in the convenience yield on the left-hand side. Our sample benchmark sample runs from 1997Q1 to 2026Q2, excluding NBER recession periods. Newey-West standard errors with 8 lags are presented in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.