The Secular Decrease in UK Safe Asset Market Power*

Jason Choi
University of Wisconsin-Madison

Duong Dang
University of Wisconsin-Madison

Rishabh Kirpalani
University of Wisconsin-Madison

Diego J. Perez
New York University and NBER

April 26, 2023

Abstract

We document the decline in market power of the U.K. in safe assets and quantify the resulting losses. We estimate an increasing elasticity of demand for U.K. public debt during the latter half of the 20th century. This is in sharp contrast to the U.S., which displays the opposite pattern with decreasing elasticities of demand during this time. We argue that the decline in market power of the U.K. in safe assets resulted in a sizable decline in seigniorage revenues.

*Choi: University of Wisconsin-Madison, jason.choi@wisc.edu. Dang: University of Wisconsin-Madison, dqdang@wisc.edu. Kirpalani: University of Wisconsin-Madison, rishabh.kirpalani@wisc.edu. Perez: New York University and NBER, diego.perez@nyu.edu. We would like to thank Ken Rogoff for insightful comments and suggestions.

1. Introduction

Safe assets are an important part of the global financial system and provide holders with a safe and liquid store of value. These assets are characterized by a large and rapidly growing demand and a relatively small number of suppliers, most notably the governments of advanced economies with sound institutions and fiscal discipline. This structure can give rise to market power for safe asset suppliers (Farhi and Maggiori, 2018). Currently, the world leader in safe asset provision is the United States government which is able to issue large levels of debt at lower interest rates than assets of similar characteristics.

The United States has been the dominant player in safe asset markets since the middle of the 20th century. Prior to that, the United Kingdom was the dominant provider of safe assets and the British Pound served as the global reserve currency (Eichengreen, 2011). In fact, the first example of safe government debt occurred in England (see Gorton, 2017 and the references within). After the Glorious Revolution of 1688, the increased role of the Parliament in fiscal affairs curbed irresponsible behavior by the Crown leading the safer debt and an increased capacity to raise funds (North and Weingast, 1989). In a related paper, Chen, Jiang, Lustig, Van Nieuwerburgh and Xiaolan (2022) show that this dominant position allowed the United Kingdom to earn significant convenience yields (up to 100 bps) on its government debt and run public debt levels beyond their fiscal capacity until the First World War.

In a previous paper, Choi, Kirpalani and Perez (2022), the authors showed that the US has sizable market power in safe assets and quantify the benefits to the United States. In this paper, we document the decline in market power of the United Kingdom and quantify its losses. We begin by documenting an increase in the elasticity of demand—an important determinant of the degree of market power—for UK public debt in the latter half of the 20th century. We then use the model to quantify the decline in seigniorage revenues and find that it is significant.

2. Estimating the Demand for UK Public Debt

In this section, we estimate the elasticity of demand for UK public debt and document its evolution over time. To do so, we estimate the following regression:

$$y_t = \alpha + \beta \ln b_t + \delta X_t + \varepsilon_t, \tag{1}$$

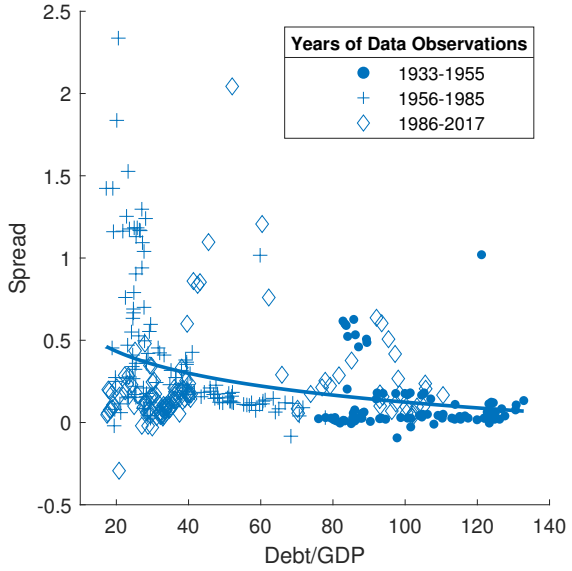
where y_t is the convenience yield on UK sovereign bonds, $\ln b_t$ is the log of the ratio of UK public debt to GDP, and X_t is a vector of controls that includes a measure of stock market volatility and the slope of the yield curve. This specification follows existing literature (e.g., Krishnamurthy and Vissing-Jorgensen, 2012), and estimates a constant semi-elasticity of prices to quantities, β.

The data is at a quarterly frequency and the time sample is from 1933 to 2017. The convenience yield is measured as the spread between the yield on UK prime commercial paper and the yield on 3-month UK sovereign bonds, both denominated in GBP. Public debt corresponds to total public debt held domestically and externally. The volatility measure is computed as the standard deviation of the weekly returns of the MSCI United Kingdom Index, computed over a yearly rolling window. Because this index is available only starting in 1972, for the earlier part of the sample we use a projection based on the yearly-rolling-window standard deviation of monthly returns of the UK share price index. The slope of the yield curve is measured as the spread between the yield on a 10-year and a 3-month UK sovereign bond.

Figure 1 shows a scatter plot of the spread and debt data. The downward-sloping line of best fit suggests a negative relationship between debt quantities and spreads. The 1940s and 1950s were characterized by a large stock of public debt fueled by the need to finance the Second World War and relatively low spreads. On the other hand, the 1970s and 1980s were decades of large spreads and a low stock of public debt.

The econometric analysis confirms this negative relationship. We pursue two complementary estimation methods: OLS and instrumental variables (IV). In the latter, we

Figure 1: Spread and Debt for UK



Notes: Spread is the difference between the yield on UK prime commercial paper and the yield on 3-month UK sovereign bond. Debt/GDP is the ratio of UK outstanding public debt to UK GDP.

instrument the supply of public debt with the log of the dependency ratio. The motivation for using this instrument is that changes in the demographic structure of the population affects social security/pension spending and thus the amount of public debt in a way that is unrelated to the demand for public debt. Table 1 shows the estimation results. The first column documents the results when we estimate (1) using OLS. We estimate a negative and statistically significant semi-elasticity of $\hat{\beta} = -0.17$, which corresponds to a demand elasticity of 1.57.[1] The elasticity estimates are similar in magnitude to those estimated for the US in prior literature. Furthermore, we estimate that high convenience yields are also associated with periods of large volatility and slope of the yield curve, for a given stock of public debt. The second column shows the estimation results using IV. The point estimate of the semi-elasticity is negative, statistically significant, and similar in magnitude to the one obtained using OLS.

We then assess whether and how this elasticity has changed over time. For this, we estimate (1) using a rolling sample in which we fix the start date at 1933, and use rolling end

[1]We obtain the demand elasticity of quantities to prices by taking the absolute value of the ratio of the average convenience yield in the sample to $\hat{\beta}$.

Table 1: Demand estimates

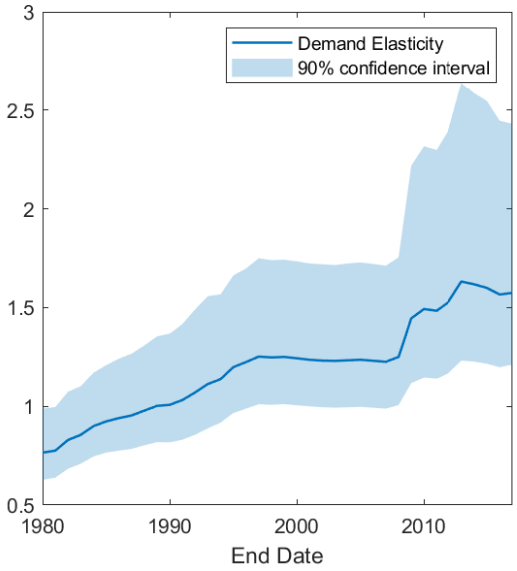
VARIABLES	(1) OLS	(3) IV
Log(debt/gdp)	-0.17***	-0.18***
	(0.03)	(0.05)
Volatility	3.7**	3.64*
	(1.88)	(2.09)
Slope	0.03**	0.04**
	(0.01)	(0.01)
Constant	0.77***	0.81***
	(0.15)	(0.22)
Observations	338	321
R-squared	0.19	0.18
Elasticity	1.57	1.47

Notes: The dependent variable is the spread between the yield on UK prime commercial paper and on 3-month UK sovereign bond. The main independent variable is ratio of UK outstanding public debt to GDP. Controls include the slope of the UK yield curve, measured as the spread between the yield on a 10-year and a 3-month UK sovereign bond, and a measure of volatility based on the standard deviation of the MSCI UK Index and UK share price index. The estimation method is OLS for column 1 and IV for column 2. Standard errors are in parentheses; *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

dates that vary from 1980 until 2017. Figure 2 shows the evolution of the estimated elasticity of demand using OLS, which is increasing over time. The estimated elasticity is 0.77 when estimated in the 1933-1980 sample, and gradually increases as we add quarters to the sample to reach 1.57 when estimated over the full sample 1933-2017. We obtain similar results if we pursue the same exercise using IV, and if we fix the sample end-date and use rolling start-dates that vary from 1933 until 1970 (see Appendix Figures 4 and 5, respectively).

Next, we contrast this trend in demand elasticity estimates for the UK with that of the US. To do so, we estimate (1) using quarterly data for the US from 1933 to 2017. We compute the convenience yield as the weighted average of short- and long-term convenience yields, with the weights given by the average share of short- and long-term US public debt. The short-term convenience yield is the difference in the yields of short-maturity AAA corporate bonds and US Treasury Bills, and the long-term convenience yield is the difference in the yields of

Figure 2: UK elasticity over rolling end dates



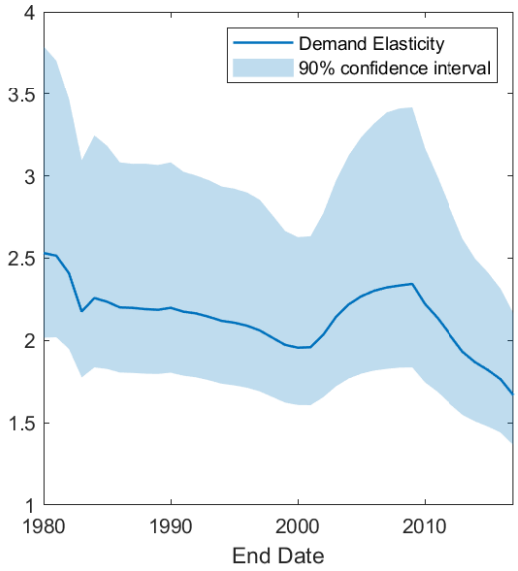
Notes: Estimated demand elasticity for UK public debt fixing the sample start date at 1933 and varying the sample end dates from 1980 to 2017.

long-maturity AAA corporate bonds and US Treasury bonds. Public debt is privately held gross federal debt. Finally, the vector of controls X_t includes a US volatility measure, and the slope of the US yield curve. From 1990 to 2017, the volatility measure is the VIX; prior to 1990, we create a historical series of VIX predicted by regressing VIX on the annualized standard deviation of the weekly log stock returns on the S&P 500 index from 1990 to 2017.

Figure 3 shows the estimated elasticity of demand for US public debt as we vary the end-date of the estimation sample. In contrast to the UK, the demand elasticity exhibits a downward trend over time. The estimated elasticity is 2.53 when estimated in the 1933-1980 sample, and 1.67 in the full 1933-2017 sample.

The results indicate that the shift in the reserve currency leader from the UK to the US that gradually occurred during the twentieth century also coincided with the demand for US public debt becoming more inelastic and the demand for UK public debt becoming more elastic. These opposing trends in demand elasticity also constitute supportive evidence of the change in the dominant safe asset provider from the UK to the US during this time period.

Figure 3: US elasticity over rolling end dates



Notes: Estimated demand elasticity for US public debt fixing the sample start date at 1933 and varying the sample end dates from 1980 to 2017.

3. Quantifying the decline in UK market power

In this section we use the model in Choi *et al.* (2022) to quantify the losses to the UK associated with this increase in the demand elasticity. The model is a two-country (UK and RoW) dynamic model with two assets, debt and capital. There are two important features of that model. First, if RoW purchases b_t units of debt in period $t-1$, it generates $f_t(b_t)$ units of the consumption good for RoW in period t. In that paper we show that these additional resources can arise if debt purchases ease collateral constraints for entrepreneurs in RoW. We assume $f(\cdot)$ to be a constant elasticity function with parameter η (elasticity $1/(1-\eta)$). Second, the country issuing debt (UK in this case) behaves as a monopolist. One result in this model is that, under some sufficient conditions, the debt issuance problem for the country with monopoly power, can be rewritten as a period-by-period static maximization of the seigniorage revenues that arise due to the non-pecuniary benefit of debt. To understand the implications for the UK of declining demand elasticity, we focus on these seigniorage revenues, which are defined as

$$\Pi_t(\eta) = \mathcal{S}_t(\eta, b_t(\eta))\, b_t(\eta) - \chi_t(b_t(\eta)),$$

where $b_t(\eta)$ is the equilibrium debt level associated with η, $\mathcal{S}_t(\eta, b_t(\eta))$ is the spread between the return on capital and that on debt and $\chi_t(b_t)$ denotes the cost of issuing debt for the U.K, which we assume to be increasing and weakly convex in b. Because we are interested in analyzing how these objects change in response to changes in the elasticity of demand, we explicitly write the variables as a function of η. From the first order condition of RoW we have that $S_t(\eta, b_t(\eta)) = f_t'(\eta, b_t(\eta))$ where we note that the function f also depends directly on the parameter η. Siegniorage revenues can be interpreted as the monopoly profits associated with the ability to issue these safe assets. As the demand elasticity changes, these monopoly profits will also change. Using the two equations above, one can use an Envelope argument to show that the change in seigniorage revenues is

$$\frac{d\Pi_t(\eta)}{d\eta} = \nu b_t^{\eta-1} \ln b_t.$$

The above equation implies that the effects of a change in η on seigniorage revenues is ambiguous. On the one hand, an increase in η (higher elasticity) implies a decrease in markups which lowers siegniorage revenues. On the other hand, an increase in η increases the equilibrium level of debt, which for a given spread, increases siegniorage revenues. If the latter debt effect is small enough, seigniorage revenues decrease as demand becomes more elastic. In particular, these revenues are decreasing in η as long as $b < 1$.

Given the theoretical ambiguity, we quantify the model to better understand the effects on seigniorage revenues. We further assume that $f(b) = \nu b^{\eta}/\eta, \chi(b) = \omega b^{1+\lambda}/(1+\lambda)$ and set $\lambda = 1$ in accordance with the literature (Barro, 1979; Jiang, Sargent, Wang and Yang, 2022). We compare the steady state change in seigniorage revenues across two elasticity values; one esitmated on the full sample and the other estimated on the post 1960's sample. The former, as shown in Table 1 is 1.57 and using a similar procedure we estimate the latter to be 2.47. The objective of this exercise is to isolate the effect of this increased elasticity on welfare. The elasticity parameter η is estimated from the regressions in the previous section.

To calibrate ω and ν and we use the following two first order conditions from the model

$$\mathcal{S}\left[1+\frac{f''(b)\,b}{f'(b)}\right]+\chi'(b)=0,$$
$$\mathcal{S}=f'(b),$$

and the data on spreads and debt levels for our full sample. The first equation is the first order condition of the monopolist debt issuer, while the second is the first order condition for the RoW. The targeted moments are an average debt-to-GDP ratio of $b = .58$, and an average spread of $\mathcal{S} = 0.26\%$. The resulting parameter values are $\omega = 0.0016$ and $\nu = 0.0018$.

The higher elasticity lowers seigniorage revenues by .02% in consumption equivalent terms. If we take into account the transition the difference in seigniorage revenues amounts to .035% in consumption equivalent terms. This suggests that, all else equal, the loss in safe asset market power resulted in non-negligible losses for the U.K.

As a final point, our focus on seigniorage revenues as opposed to overall welfare is motivated the fact that most of the welfare gains associated with the higher elasticity is due to the difference in seigniorage revenues. In particular, the overall welfare reduction (including the transition) is .04% in terms of consumption as compared with .035% which arises due to the change in seigniorage revenues.

4. Conclusion

The case of the U.K. suggests that U.S. dominance in safe asset markets is unlikely to last forever. Indeed, there are efforts to produce competitor safe assets by both sovereigns and private financial institutions. An interesting recent example is the case of China. As argued in Clayton, Dos Santos, Maggiori and Schreger (2022), China's policy of selectively opening up their bond markets to international investors is consistent with a strategy to build reputation and establish itself as a safe issuer of assets. It is still too early to tell whether and if there will be a significant change in the level of competition in safe asset markets, but it is important to understand its potential effects.

References

Barro, R. J. (1979). On the determination of the public debt. *Journal of political Economy*, **87** (5, Part 1), 940–971.

Chen, Z., Jiang, Z., Lustig, H., Van Nieuwerburgh, S. and Xiaolan, M. Z. (2022). *Exorbitant Privilege Gained and Lost: Fiscal Implications*. Tech. rep., National Bureau of Economic Research.

Choi, J., Kirpalani, R. and Perez, D. J. (2022). The macroeconomic implications of us market power in safe assets.

Clayton, C., Dos Santos, A., Maggiori, M. and Schreger, J. (2022). Internationalizing like china. *NBER Working Paper*.

Eichengreen, B. (2011). *Exorbitant Privilege: The rise and fall of the Dollar and the Future of the International Monetary System*. Oxford University Press.

Farhi, E. and Maggiori, M. (2018). A model of the international monetary system. *The Quarterly Journal of Economics*, **133** (1), 295–355.

Gorton, G. (2017). The history and economics of safe assets. *Annual Review of Economics*, **9**, 547–586.

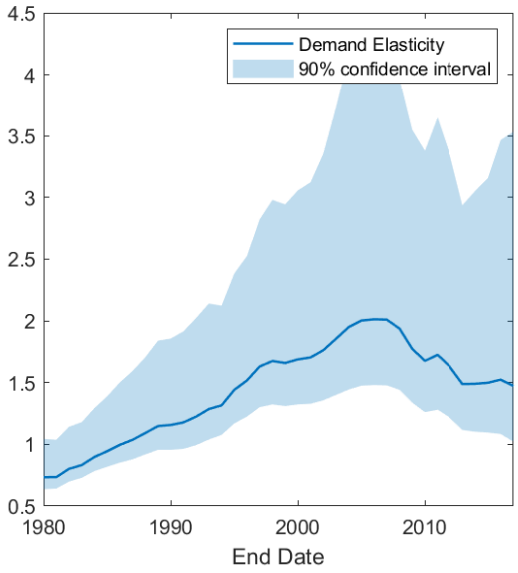
Jiang, W., Sargent, T. J., Wang, N. and Yang, J. (2022). *A p Theory of Government Debt and Taxes*. Tech. rep., National Bureau of Economic Research.

Krishnamurthy, A. and Vissing-Jorgensen, A. (2012). The aggregate demand for treasury debt. *Journal of Political Economy*, **120** (2), 233–267.

North, D. C. and Weingast, B. R. (1989). Constitutions and commitment: the evolution of institutions governing public choice in seventeenth-century england. *The journal of economic history*, **49** (4), 803–832.

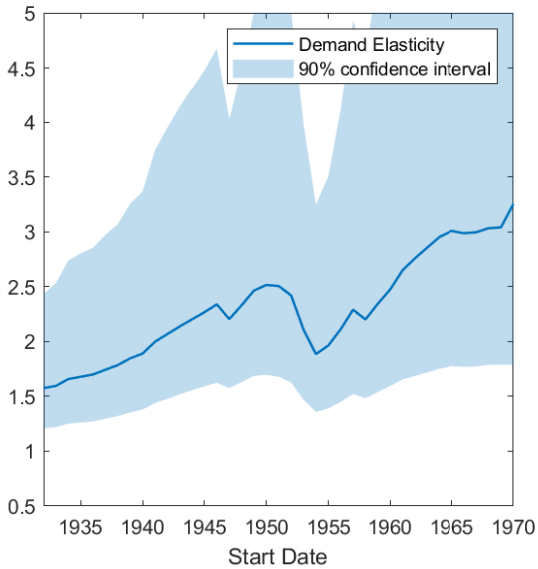
A. Appendix

Figure 4: UK elasticity over rolling end dates (IV)



Notes: Estimated demand elasticity for UK bonds via IV, fixing the sample start date at 1933 and varying the sample end dates from 1980 to 2017.

Figure 5: UK elasticity over rolling start dates



Notes: Estimated demand elasticity for UK bonds fixing the sample end date at 2017 and varying the sample start dates from 1933 to 1970.