Exorbitant Privilege Gained and Lost: Fiscal Implications

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Exorbitant Privilege

▶ Gourinchas, Rey, and Sauzet (2019): *"Being the hegemon confers a specific ability to issue large amounts of nominally safe liabilities (dollar securities), which are happily absorbed by the rest of the world. Thus, the view is that, in case of a deficit, the United States does not have to take restrictive measures, so that the dollar is not an impartial means of international exchange. This is the essence of the exorbitant privilege."*

▶ Our paper: How do we weigh this exorbitant privilege with the concerns about fiscal sustainability in the U.S.?

Our Paper

- We study three centuries of fiscal history and estimate the fiscal backing of the Dutch, U.K., and U.S. government debt.

  - There is a unique hegemon who dominates the supply of safe assets.

  - When a country plays this role, its government debt enjoys a lower yield relative to other sovereign debt—convenience yields.

    - We conduct a fiscal valuation exercise.
    - The hegemon issues more government debt than what is warranted by its own fiscal fundamentals, even after we account for seigniorage revenues
    - When the hegemon's relative fundamentals deteriorate, this extra fiscal capacity is eventually withdrawn—exorbitant privilege lost.

More Concretely

- U.K. had quasi-monopoly as world's safe asset supplier in 19th century
  - London was the world's financial center and gilts accounted for more than 1/2 of the world's traded securities in 1815.
  - Gilts traded at much lower yields (Hall, Payne, Sargent, and Szőke, 2021).
  - In the two centuries before WW-I, only 3/4 of U.K. debt was backed by future surpluses.
- During the Interbellum years, U.K. in fiscal crisis:
  - The U.K. abandoned the gold standard at the start of WW-I, briefly returned to it in 1925, only to permanently abandon it in 1931.
  - Financial repression during and after WW-I; Restructuring of U.K. loans.
  - Gilts started trading at higher yields than foreign bonds.
- After WW-II, the U.K. yielded its leading position to the U.S.
  - The U.K. debt no longer earned convenience yields,
 - Debt has always been more than fully backed by our estimate of government surpluses.

In Contrast

- Before WW-I, the U.S. had to finance its debt at a much higher rate relative to the U.K.
    - The U.S. government debt was more than fully backed by its primary surpluses.
- After WW-II, the U.S. became the world's safe asset issuer.
    - Its debt enjoyed a significant convenience yield relative to other bonds.
    - The market value of its debt well exceeded its fiscal backing.

Related Literature

- **Fiscal capacity of the government** (Bassetto and Cui, 2018; Blanchard, 2019; Furman and Summers, 2020; Mehrotra and Sergeyev, 2021; Mian, Straub, and Sufi, 2021; Brunnermeier, Merkel, and Sannikov, 2022; Liu, Schmid, and Yaron, 2020; Reis, 2021) - Jiang et al. (19,20,21,22,23a,23b)

- **Special role of the dollar** as the reserve currency **and the U.S.** as the world's safe asset supplier (see Gourinchas and Rey, 2007; Caballero, Farhi, and Gourinchas, 2008; Caballero and Krishnamurthy, 2009; Maggiori, 2017; He, Krishnamurthy, and Milbradt, 2018; Farhi and Maggiori, 2018; Gopinath and Stein, 2018; Krishnamurthy and Lustig, 2019; Choi, Kirpalani, and Perez, 2022; Mukhin, 2022)

- Special role for **Treasurys providing insurance**: (Bassetto and Cui, 2018; Chien and Wen, 2019; Angeletos, Collard, and Dellas, 2020; Brunnermeier, Merkel, and Sannikov, 2022; Reis, 2021)

- U.S. Treasurys are **expensive relative to other bonds** (Krishnamurthy and Vissing-Jorgensen, 2012; Bai and Collin-Dufresne, 2019; Fleckenstein, Longstaff, and Lustig, 2014; Du, Im, and Schreger, 2018; Jiang, Krishnamurthy, and Lustig, 2021; Koijen and Yogo, 2019; Di Tella, Hébert, Kurlat, and Wang, 2023)
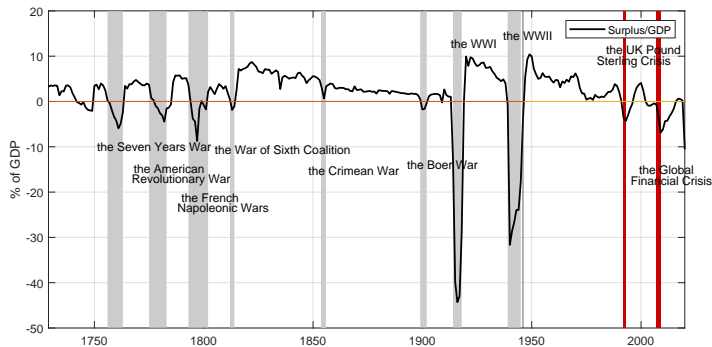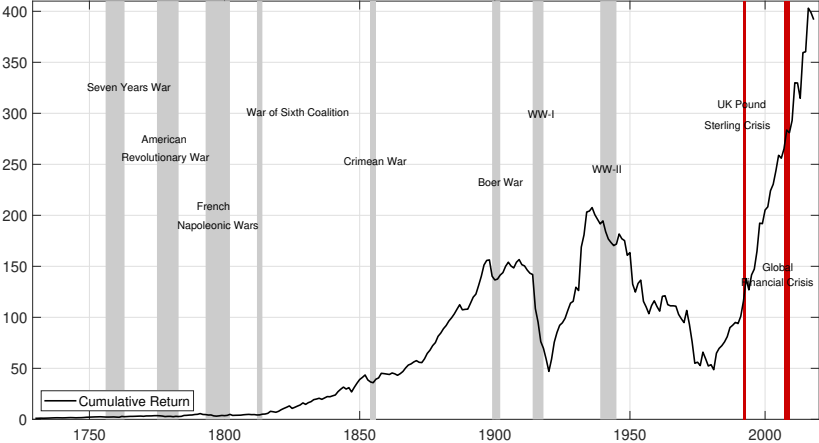
U.K. Market Value of Debt/GDP
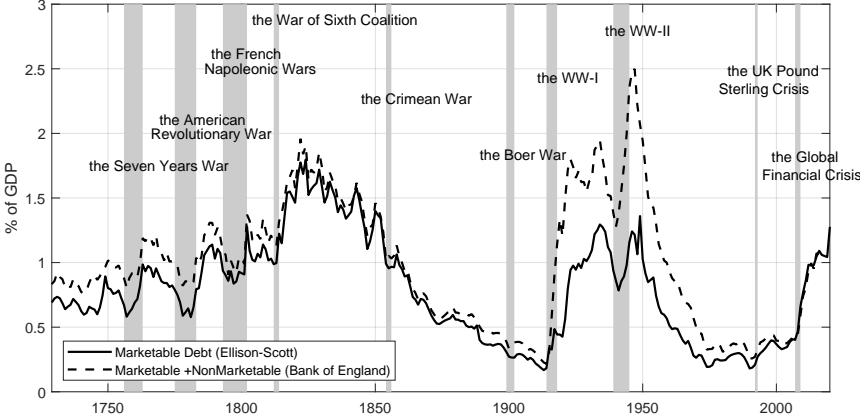
U.K. Primary Surpluses

Pre-WWI: Barro-Gallatin tax smoothing for wars (Barro, 1979; Aiyagari, Marcet, Sargent, and Seppälä, 2002)
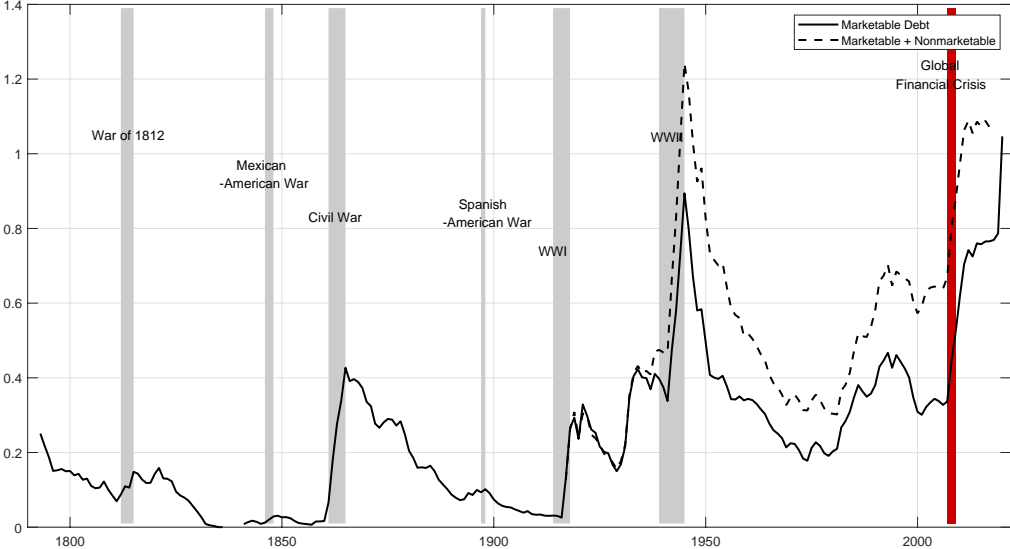
- ▶ Consistent primary surpluses in peacetime and temporary, large deficits in wartime
- ▶ Primary surpluses are 2.38% on average and acyclical w.r.t. business cycles

U.K. Cumulative Real Return: 1729 – 2020

The Market Value of Outstanding Debt to GDP in U.S.

Measuring Fiscal Backing

Pricing the Entire Government Bond Portfolio

- ▶ Government debt is backed by current and future primary surpluses

  - ▶ Government budget constraint:

$$D_t = \sum_{h=0}^{H} Q_{t-1}^{h+1} P_t^h \quad = \quad T_t - G_t + \sum_{h=1}^{H} Q_t^h P_t^h$$

  - ▶ Iterate forward on budget constraint + impose no-arbitrage:

$$D_t = \mathbb{E}_t \left[\sum_{j=0}^{T} M_{t,t+j}(T_{t+j} - G_{t+j}) \right] + \mathbb{E}_t \left[M_{t,t+T} D_{t+T} \right]$$

  - ▶ Define Fiscal Backing (FB) as the present value of primary surpluses

$$FB_t = \mathbb{E}_t \left[\sum_{j=0}^{\infty} M_{t,t+j} T_{t+j} \right] - \mathbb{E}_t \left[\sum_{j=0}^{\infty} M_{t,t+j} G_{t+j} \right] = P_t^T - P_t^G$$

  - ▶ $FB = D_t$ under TVC $\mathbb{E}_t \left[M_{t,t+T} D_{t+T} \right] \to 0$ as $T \to \infty$

Campbell-Shillerized Measurement of Fiscal Backing

▶ Fiscal backing = PV(Surpluses)

$$FB_t = P_t^T - P_t^G = T_t \exp(pd_t^T) - G_t \exp(pd_t^G),$$

where $pd_t^T = \log(P_t^T/T_t)$ and $pd_t^G = \log(P_t^G/G_t)$.

▶ Log-linearize the tax and spending claim return equations and iterate forward (Jiang, Lustig, Van Nieuwerburgh, and Xiaolan, 2019):

$$
\begin{array}{rcl}
pd_t^T & = & \dfrac{\kappa_0^T}{1 - \rho_T} + \mathbb{E}_t \left[\displaystyle\sum_{j=1}^{\infty} \rho_T^{j-1} \Delta \log T_{t+j} \right] - \mathbb{E}_t \left[\displaystyle\sum_{j=1}^{\infty} \rho_T^{j-1} r_{t+j}^T \right], \\[3ex]
pd_t^G & = & \dfrac{\kappa_0^G}{1 - \rho_G} + \mathbb{E}_t \left[\displaystyle\sum_{j=1}^{\infty} \rho_G^{j-1} \Delta \log G_{t+j} \right] - \mathbb{E}_t \left[\displaystyle\sum_{j=1}^{\infty} \rho_G^{j-1} r_{t+j}^G \right],
\end{array}
$$

where ρ_T, ρ_G, κ_0^T, κ_0^G depend on the mean of their respective log p/d ratios

Measuring Fiscal Backing at Steady State

▶ Steady-state FB/Y:

$$\frac{FB}{Y} = \frac{T}{Y}\exp(pd_0^T) - \frac{G}{Y}\exp(pd_0^G),$$

$$pd_0^T = -\frac{(y_0^\$(1) + yspr_0^\$ + rp_0^T) - (x_0 + \pi_0)}{1 - \rho_T} + \frac{\kappa_0^T}{1 - \rho_T},$$

$$pd_0^G = -\frac{(y_0^\$(1) + yspr_0^\$ + rp_0^G) - (x_0 + \pi_0)}{1 - \rho_G} + \frac{\kappa_0^G}{1 - \rho_G}.$$

▶ Determinants:

1. Steady-state surplus: $(T - G)/Y$
2. *Discount rate component* of pd_0: the short rate ($y_0^\$(1)$), the yield spread ($yspr_0^\$$), and the risk premium (rp_0^i)
3. *Cash flow component* of pd_0: GDP growth ($x_0 + \pi_0$), since T and G are co-integrated with output

Upper Bound on Steady-State Fiscal Backing

▶ We expect $rp_0^T \geq rp_0^Y \geq rp_0^G$. Why?

   ▶ At business cycle frequency, spending/GDP is counter-cyclical and tax/GDP is pro-cyclical: $\beta(T_{t+1}) \geq \beta(Y_{t+1}) \geq \beta(G_{t+1})$. More so after WW-II.

   ▶ In long run, tax and spending are cointegrated with output: $\beta(T_{t+\infty}) = \beta(Y_{t+\infty}) = \beta(G_{t+\infty})$.

▶ Assuming $rp_0^T = rp_0^Y = rp_0^G$ then delivers an **upper bound** on Fiscal Backing:

$$\frac{FB}{Y} \leq \underbrace{\frac{1}{(y_0^\$(1) + yspr_0^\$ + rp_0^Y) - (x_0 + \pi_0)}}_{\exp(pd_0^Y)} \left(\frac{T}{Y} - \frac{G}{Y} \right) \equiv \frac{FB^{UB}}{Y}$$

1. Countries with higher GDP growth x_0 and lower real rates $y_0^\$(1) - \pi_0$ have higher pd_0^Y and FB (Blanchard, 2019)

2. Countries with higher risk premium rp_0^Y and slope of the yield curve $yspr_0^\$$ have lower pd_0^Y and FB

Measuring the GDP Risk Premium

- ▶ Risk premium on GDP claim is risk premium on total wealth portfolio
- ▶ Total wealth return commonly proxied as the unlevered stock return
- ▶ Implementation: leverage is 0.46 in U.K. and 0.56 in U.S.

	equity RP vs Rf	corporate bond RP vs Rf	LT bond vs Rf	unlevered equity RP vs. Rf	unlevered equity RP vs. LT bond
	United Kingdom				
1870-2020	5.64%	1.45%	0.96%	3.68%	2.73%
1946-2020	7.89%	2.27%	1.53%	5.42%	3.88%
	United States				
1870-2020	6.33%	1.35%	0.69%	3.51%	2.82%
1946-2020	7.56%	1.79%	1.45%	4.49%	3.80%

- ▶ Based on this evidence, we fix GDP risk premium vs. LT bond, rp_0^Y, at 3% per year

What About Convenience Yields?

▶ Measure convenience yields from CIP violations in govt. bond markets (see Jiang, Krishnamurthy, and Lustig, 2021)

▶ During gold standard, no FX movement, interest rate differentials are violations of CIP
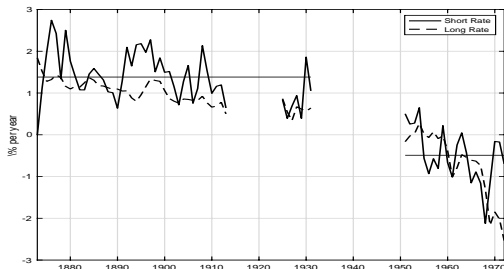
Average of 15 countries on gold standard vs. U.K. Source: Jordà-Schularick-Taylor Macrohistory database.

▶ Gilts earned a convenience yield λ_0 of 100 basis points per year in 1873–1931

Upper Bound on Fiscal Backing at Steady State

▶ With seigniorage revenue from convenience yields (Jiang, Lustig, Van Nieuwerburgh, and Xiaolan, 2019),

$$D_t = \mathbb{E}_t \left[\sum_{j=0}^{\infty} M_{t,t+j} T_{t+j} \right] + \mathbb{E}_t \left[\sum_{j=0}^{\infty} M_{t,t+j} D_{t+j} (1 - e^{-\lambda_{t+j}}) \right] - \mathbb{E}_t \left[\sum_{j=0}^{\infty} M_{t,t+j} G_{t+j} \right]$$

▶ Upper bound

$$\frac{FB}{Y} \leq \frac{1}{(y_0^{\$}(1) + yspr_0^{\$} + rp_0^{Y}) - (x_0 + \pi_0)} \left(\frac{T}{Y} + \frac{Seign}{Y} - \frac{G}{Y} \right)$$

▶ Seigniorage revenue $Seign = \lambda \times D$: convenience yield times debt outstanding

▶ U.K. seigniorage revenue averages 0.34% of GDP for 1729–1946

Steady-State Fiscal Backing Pre-WW-I

	UK:1729-1914	US: 1793-1914
x_0	1.58	4.08
π_0	0.16	0.77
$y_0^\$$	4.88	4.50
$\exp(pd_0^Y)$	20.68	39.06
s_0	2.38	0.46
λ_0	0.69	0
Seign./Y	0.29	0
FB/Y	55.73	17.79
D/Y	86.45	11.91
FB/D	64.46	149.30

▶ Quantity dimension of exorbitant privilege

Dynamic Measure of Fiscal Backing

▶ Allow for dynamics in (i) expected tax revenue and spending growth rates, and (ii) in the expected return on the GDP claim

▶ Dynamics of Fiscal Backing governed by:

$$\frac{FB_t}{Y_t} = \frac{T_t}{Y_t}\exp(CF_t^T - DR_t^T) - \frac{G_t}{Y_t}\exp(CF_t^G - DR_t^G)$$

$$CF_t^T = \mathbb{E}_t\left[\sum_{j=1}^{\infty}\rho_T^{j-1}\Delta\log T_{t+j}\right], \qquad DR_t^T = \mathbb{E}_t\left[\sum_{j=1}^{\infty}\rho_T^{j-1}r_{t+j}^T\right]$$

▶ Use VAR to construct cash flow and discount rate terms

$$z_t = \mathbf{\Psi} z_{t-1} + u_t,$$

▶ State z_t includes inflation, short rate, yield spread, real GDP growth, stock dividend/GDP growth and level, stock p/d ratio, tax/GDP growth and level, spending/GDP growth and level

▶ Impose cointegration between spending, taxes and output

▶ Regime shift: we estimate separate VARs for pre-WW-II and post-WW-II samples.

U.K. and U.S. Fiscal Backing Pre-WW-II
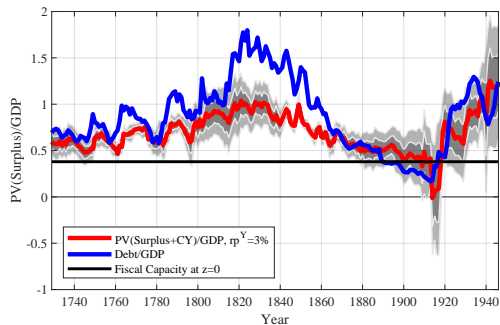
(a) U.K.
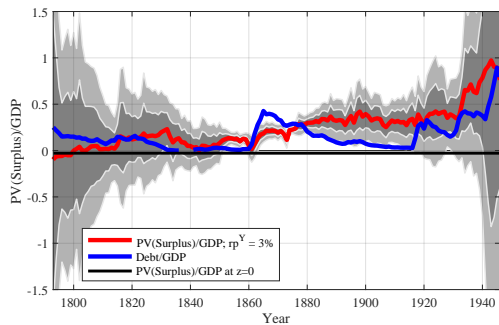
(b) U.S.

▶ Robustness: consolidation of colonial government balance sheets strengthened our conclusion. UK Commonwealth
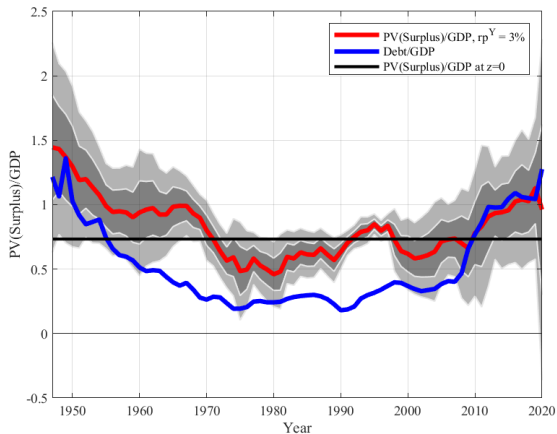
Average Fiscal Backing Pre-WW-I and Pre-WW-II

Table: Pre-WW-I

	UK:1729-1914	US: 1793-1914
$\exp(pd_0^Y)$	20.68	39.06
s_0	2.38	1.97
λ_0	0.69	0
Seign./Y	0.29	0
FB/Y	60.18	20.18
D/Y	86.45	11.91
FB/D	69.61	169.36
$\rho(FB/Y, D/Y)$	0.78	0.13

Table: Pre-WW-II

	UK:1729-1946	US: 1793-1946
$\exp(pd_0^Y)$	22.22	49.17
s_0	1.22	3.41
λ_0	1.00	0
Seign./Y	0.34	0
FB/Y	64.29	23.61
D/Y	87.06	16.53
FB/D	73.84	142.87
$\rho(FB/Y, D/Y)$	0.82	0.62

U.K. and U.S. Fiscal Backing: Post-WW-II

(a) U.K.
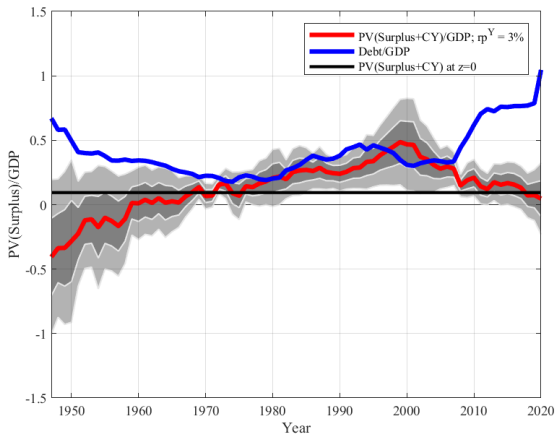
(b) U.S.

U.S. and U.K. Fiscal Backing After WW-II

|	UK:1947-2020	US: 1947-2020
λ_0	0	0.56
Seign./Y	0	0.11
	Steady-state at $z = 0$	
FB/Y	73.31	9.40
FB/D	137.24	22.93
	Sample Averages	
FB/Y	82.12	13.20
D/Y	53.42	40.99
FB/D	153.73	32.20
$\rho(FB/Y, D/Y)$	0.80	-0.17

Privilege Gained and Lost: The Dutch Experience

- The provincial governments of the Dutch Republic had local monopoly as safe asset suppliers in 17th and part of 18th century

    - Financial revolution: Dutch provinces issue bonds, tapping into new investor base of emerging upper class (C't Hart, 1993; Schultz and Weingast, 2003)
    - Amsterdam was the world's financial center. Dutch Florin was reserve currency
    - Political participation by debtholders: more fiscal discipline (North and Weingast, 1989)
    - Yields on annuities issued by Holland 1.5% lower than those on British consols

- After 1815, fiscal crisis in the Netherlands

    - Wars lost
    - Debt overhang and restructuring
    - World's financial center moved to London

The Book Value of Outstanding Debt to GDP
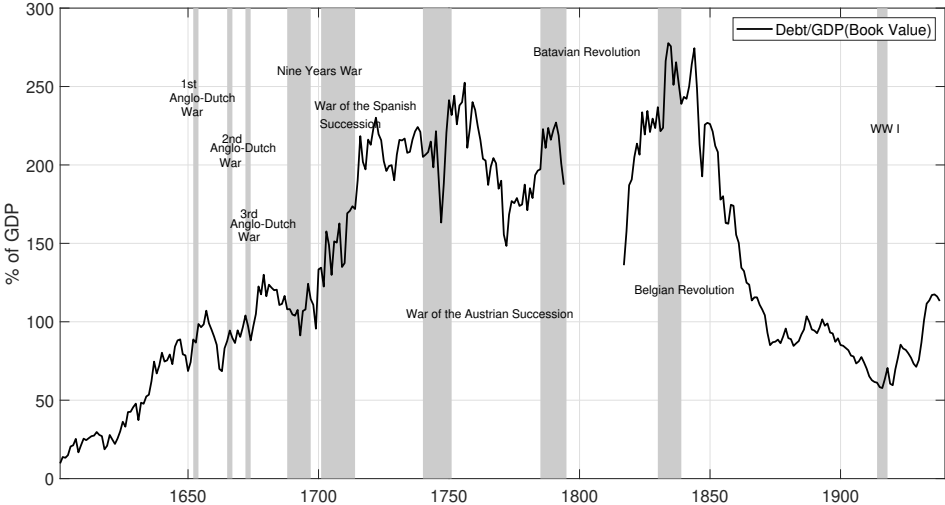
Book value of debt issued by the province of Holland from 1601 to 1794 and the central Dutch government over the sample period from 1817–1914.
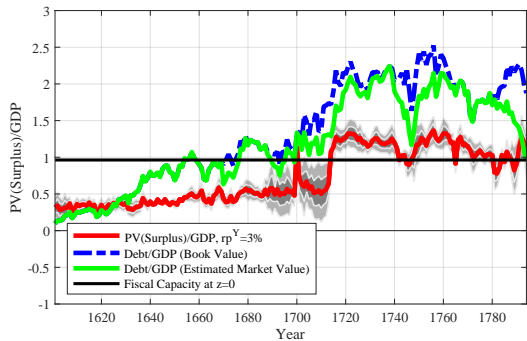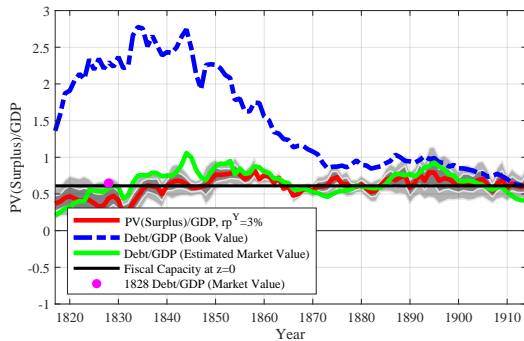
Dutch Fiscal Cash Flows
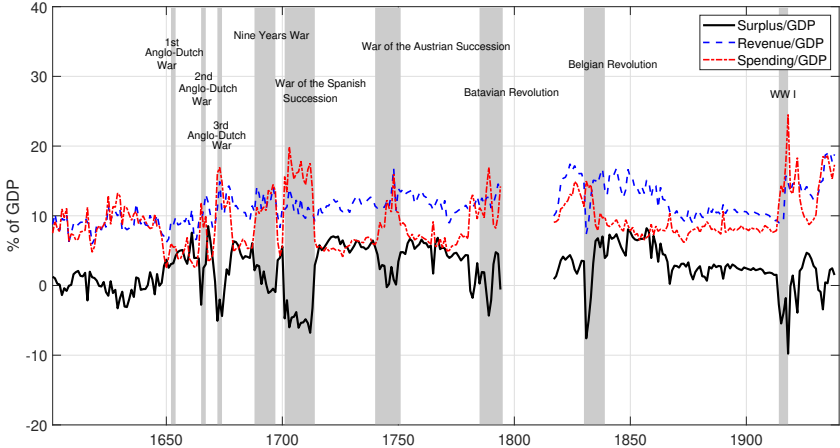
The Dutch Experience: 17th/18th Century vs. 19th Century

|	1601 – 1794 Province of Holland	1817 – 1914 The Netherlands
λ_0	1.5	0
Seign./Y	2.38	0
	Steady-state at $z = 0$	
FB/Y	61.58	61.06
	Sample Averages	
FB/Y	71.19	60.53
D/Y	118.89	65.72
FB/D	59.88	92.10
$\rho(FB/Y, D/Y)$	0.94	0.64

The Dutch Experience

(a) Holland

(b) Netherlands

Market value of debt falling after 1800. Debt restructuring after 1815.

Conclusion

▶ Investors concentrate extra fiscal backing in the world's safe asset supplier beyond what is warranted by its fundamentals and convenience yields.

▶ When the safe asset supplier's relative fundamentals deteriorate, that extra fiscal backing is withdrawn by bond investors who then focus only on the country's fundamentals.

▶ Implications for today's hegemon

U.K. Real Rates: 1729 – 2020
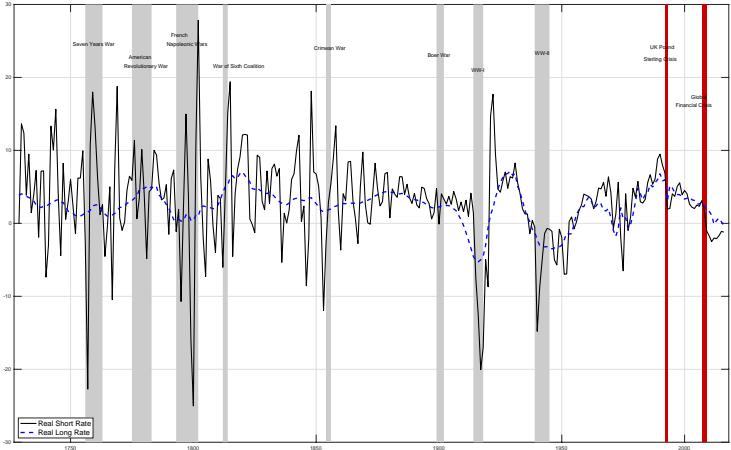
U.K. Commonwealth

Figure: Fiscal Capacity: Consolidating Colonial Government Finance
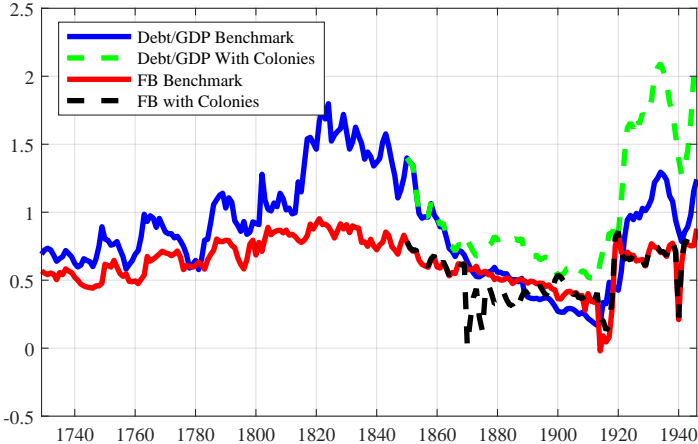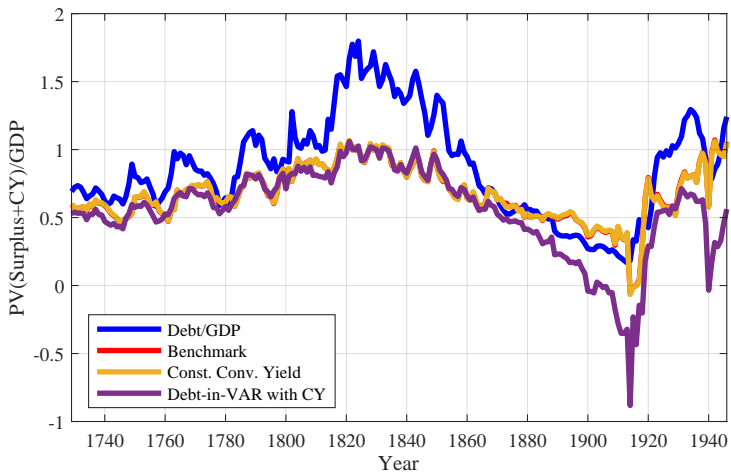
Figure: Fiscal Capacity with Convenience Yields: U.K. 1729 – 1946

Aiyagari, S. R., A. Marcet, T. J. Sargent, and J. Seppälä, 2002, "Optimal taxation without state-contingent debt," *Journal of Political Economy*, 110(6), 1220–1254.

Angeletos, G.-M., F. Collard, and H. Dellas, 2020, "Public Debt as Private Liquidity: Optimal Policy," .

Bai, J., and P. Collin-Dufresne, 2019, "The CDS-bond basis," *Financial Management*, 48(2), 417–439.

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

Bassetto, M., and W. Cui, 2018, "The fiscal theory of the price level in a world of low interest rates," *Journal of Economic Dynamics and Control*, 89, 5–22, Fed St. Louis-JEDC-SCG-SNB-UniBern Conference, titled: "Fiscal and Monetary Policies".

Blanchard, O., 2019, "Public debt and low interest rates," *American Economic Review*, 109(4), 1197–1229.

Brunnermeier, M., S. Merkel, and Y. Sannikov, 2022, "Debt As A Safe Asset," NBER Working Paper No. 29626.

Caballero, R. J., E. Farhi, and P.-O. Gourinchas, 2008, "An Equilibrium Model of "Global Imbalances" and Low Interest Rates," *American Economic Review*, 98(1), 358–93.

Caballero, R. J., and A. Krishnamurthy, 2009, "Global Imbalances and Financial Fragility," *American Economic Review*, 99(2), 584–88.

Chien, Y., and Y. Wen, 2019, "The Determination of Public Debt under Both Aggregate and Idiosyncratic Uncertainty," Federal Reserve Bank of St. Louis Working Paper.

Choi, J., R. Kirpalani, and D. J. Perez, 2022, "The macroeconomic implications of US market power in safe assets," `https://www.rkirpalani.com/s/CKP.pdf`, Accessed: 2022-4-28.

C't Hart, M., 1993, *The Making of a Bourgeois State: War, Politics and Finance During the Dutch Revolt*. Manchester University Press.

Di Tella, S., B. Hébert, P. Kurlat, and Q. Wang, 2023, "The Zero-Beta Rate," `https://gsb-faculty.stanford.edu/benjamin-hebert/files/2023/03/TheZeroBetaRate_March2023.pdf`, Accessed: 2023-6-28.

Du, W., J. Im, and J. Schreger, 2018, "The us treasury premium," *J. Int. Econ.*, 112, 167–181.

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

Fleckenstein, M., F. A. Longstaff, and H. Lustig, 2014, "The TIPS-treasury bond puzzle," *the Journal of Finance*, 69(5), 2151–2197.

Furman, J., and L. Summers, 2020, "A reconsideration of fiscal policy in the era of low interest rates," `https://www.brookings.edu/wp-content/uploads/2020/11/`

`furman-summers-fiscal-reconsideration-discussion-draft.pdf`, Accessed: 2020-12-27.

Gopinath, G., and J. C. Stein, 2018, "Banking, Trade, and the Making of a Dominant Currency," working paper, Harvard University.

Gourinchas, P.-O., and H. Rey, 2007, "International financial adjustment," *Journal of political economy*, 115(4), 665–703.

Gourinchas, P.-O., H. Rey, and M. Sauzet, 2019, "The international monetary and financial system," *Annual Review of Economics*, 11, 859–893.

Hall, G., J. Payne, T. J. Sargent, and B. Szőke, 2021, "Costs of financing US federal debt: 1791-1933," `https://people.brandeis.edu/~ghall/papers/Yield_Curve_08_29_2021.pdf`, Accessed: 2022-4-5.

He, Z., A. Krishnamurthy, and K. Milbradt, 2018, "A Model of Safe Asset Determination," *American Economic Review*.

Jiang, Z., A. Krishnamurthy, and H. Lustig, 2021, "Foreign Safe Asset Demand and the Dollar Exchange Rate," *The Journal of Finance*, n/a(n/a).

Jiang, Z., H. Lustig, S. Van Nieuwerburgh, and M. Z. Xiaolan, 2019, "The U.S. Public Debt Valuation Puzzle," Working Paper 26583, National Bureau of Economic Research.

Koijen, R. S. J., and M. Yogo, 2019, "Exchange Rates and Asset Prices in a Global Demand System," Working Paper University of Chicago Booth.

Krishnamurthy, A., and H. N. Lustig, 2019, "Mind the gap in sovereign debt markets: The US Treasury basis and the Dollar risk factor," in *2019 Jackson Hole Economic Symposium, Stanford University Graduate School of Business Research Paper*, no. 3443231.

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

Liu, Y., L. Schmid, and A. Yaron, 2020, "The risks of safe assets," Working paper USC Marshall School of Business.

Maggiori, M., 2017, "Financial Intermediation, International Risk Sharing, and Reserve Currencies," *American Economic Review*, 107(10), 3038–71.

Mehrotra, N. R., and D. Sergeyev, 2021, "Debt sustainability in a low interest rate world," *Journal of Monetary Economics*, 124, S1–S18, The Real Interest Rate and the MarginalProduct of Capital in the XXIst CenturyOctober 15-16, 2020.

Mian, A., L. Straub, and A. Sufi, 2021, "A Goldilocks Theory of Fiscal Policy," NBER Working Paper No. 29351.

Mukhin, D., 2022, "An Equilibrium Model of the International Price System," *American Economic Review*, 112(2), 650–88.

North, D. C., and B. R. Weingast, 1989, "Constitutions and Commitment: The Evolution of Institutions Governing Public Choice in Seventeenth-Century England," *J. Econ. Hist.*, 49(4), 803–832.

Reis, R., 2021, "The Constraint on Public Debt when $r < g$ but $g < m$," Working Paper London School of Economics.

Schultz, K. A., and B. R. Weingast, 2003, "The Democratic Advantage: Institutional Foundations of Financial Power in International Competition," *International Organization*, 57(1), 3–42.