GOVERNMENT DEBT MANAGEMENT: THE LONG AND SHORT OF IT

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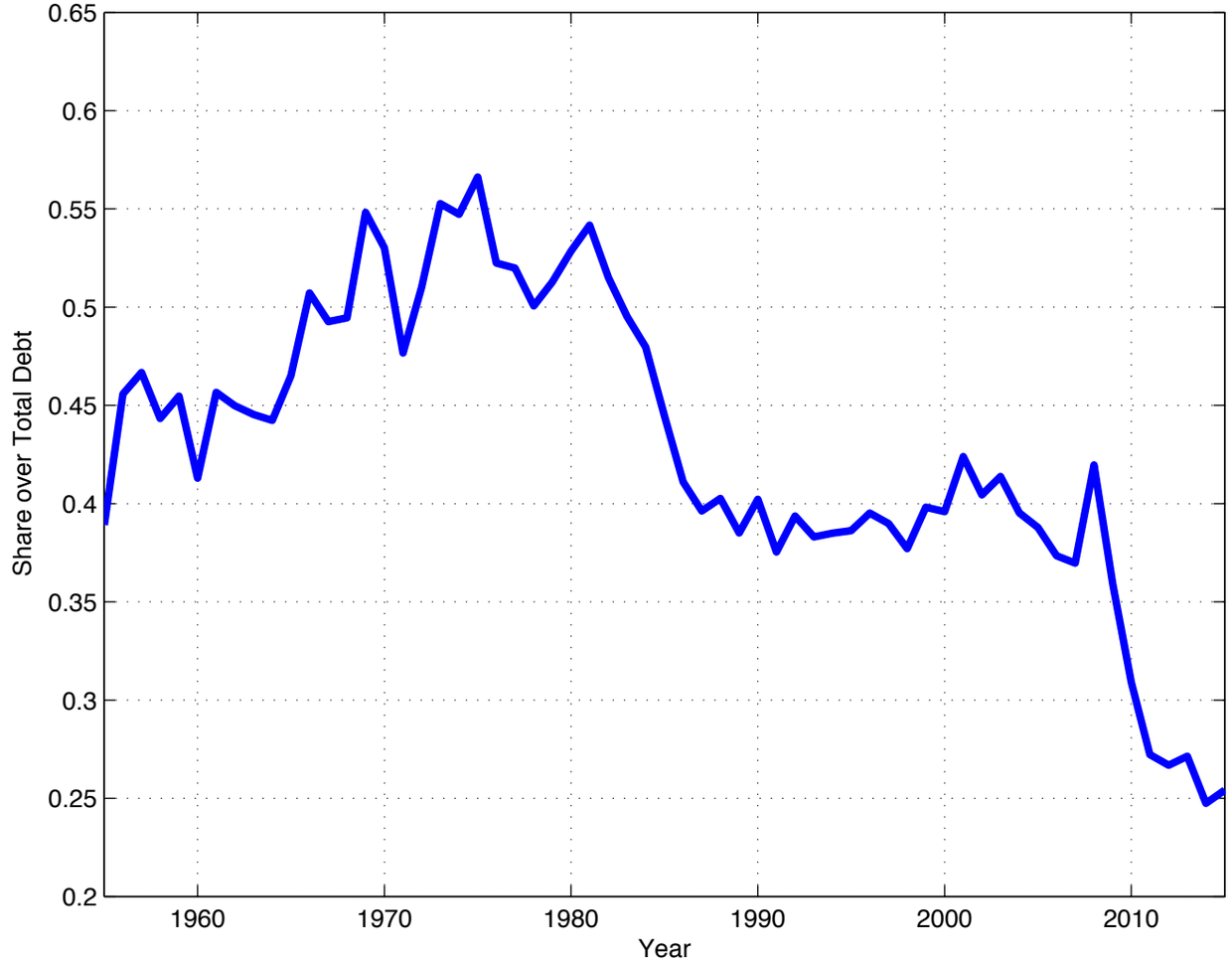
ACTUAL DEBT MANAGEMENT

Lots of short-term government debt, with portfolio share that is highly serially correlated and not too volatile, since issuance of debt of all maturities as a ratio of GDP moves together.

Figure 1: **Share of Short Term Debt in the US**



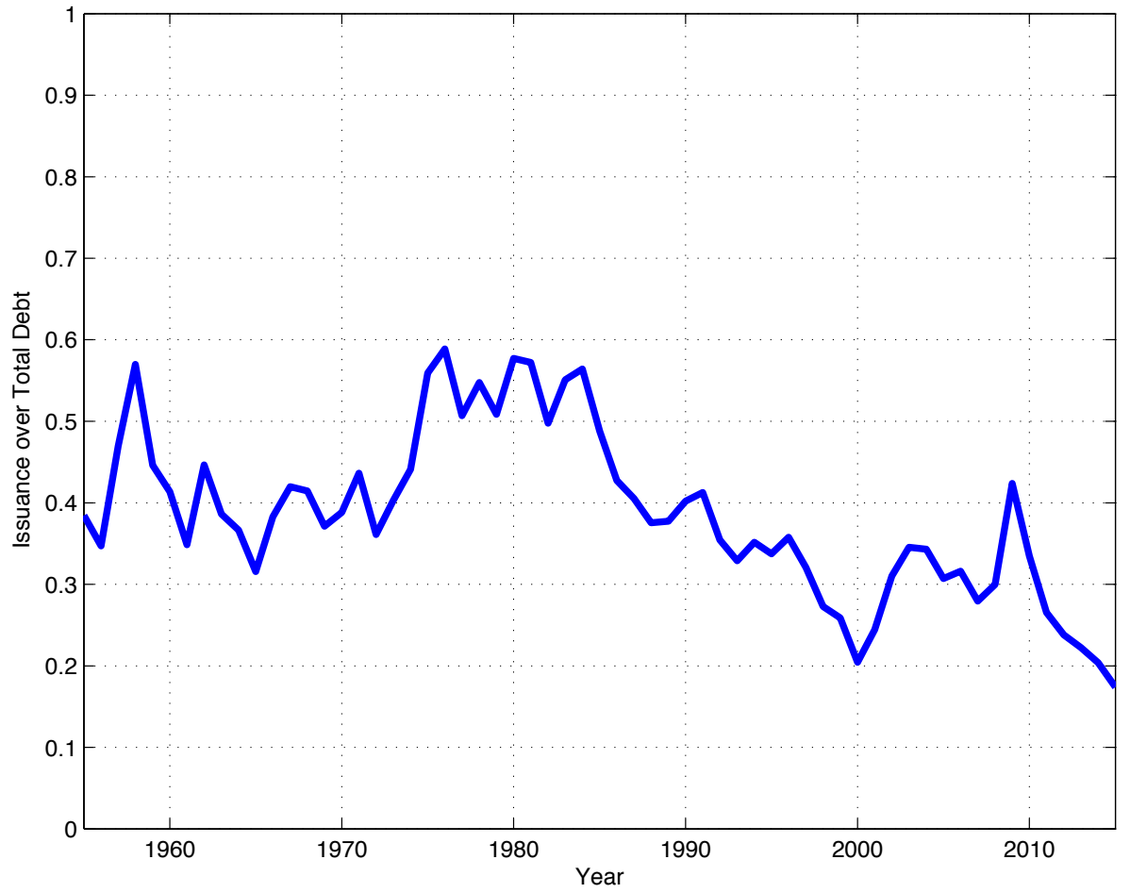
Notes: The Figure plots the share of short maturity government debt (less than or equal to one year) in the US over the period 1955-2015. The data are annual observations (time aggregated from monthly data extracted from the CRSP). Details on the data construction are contained in the Appendix.

ACTUAL DEBT MANAGEMENT

Rare repurchase and reissue, so (new) issues are about 1/3-1/2 of overall debt (robust to callable bonds).

Remaining Term (in quarters)	**Normalized Count**
0	98.86%
1	0.70%
2-4	0.24%
5-9	0.05%
10-14	0.02%
≥15	0.13%

Figure 2: **Total Issuance as a Fraction of the Market Value of Outstanding Debt**



Notes: The Figure plots the issuance of new government debt by year and in market value, as a fraction of the total market value of debt outstanding in the United States. The data are from the CRSP and refer to the period 1955-2015.

MODEL DEBT MANAGEMENT

One strand: incomplete markets and insurance (Angeletos, 2002)

- Aggregate shocks change real interest rate profile over time, so change relative price of bonds of different maturities.
- Debt profile then affects the response of fiscal burden to shocks, makes debt payments state contingent.
- "Completes markets"

Difficulties:

- At optimum issue long-term bonds, buy short-term assets Buera Nicolini (2004). Real interest rates move too little.
- Commitment problem: ex post will raise real interest rates to devalue the long-term debt. (Debortoli, Nunes, Yared, 2016)

STANDARD MODEL

Fiscal burden $$W_t = \sum_{j=0}^{\infty} \frac{H_t^j B_t^j}{P_t} + \sum_{j=0}^{\infty} Q_t^j K_t^j$$

Budget constraint $$W_t = s_t + \sum_{j=0}^{\infty} \frac{H_t^{j+1} B_{t+1}^j}{P_t} + \sum_{j=0}^{\infty} Q_t^{j+1} K_{t+1}^j$$

Combining them

$$W_0 = W_{t+1} \prod_{\tau=0}^{t} Q_\tau^1 + \sum_{i=0}^{t} \prod_{\tau=0}^{i} Q_\tau^1 s_i + \sum_{i=0}^{t} \prod_{\tau=0}^{i} Q_\tau^1 \sum_{j=0}^{\infty} \left(H_i^{j+1} - H_i^1 H_{i+1}^j \right) \frac{B_{i+1}^j}{P_i}$$

$$+ \sum_{i=0}^{t} \prod_{\tau=0}^{i} Q_\tau^1 \sum_{j=0}^{\infty} \left(Q_i^{j+1} - Q_i^1 Q_{i+1}^j \right) K_{i+1}^j + \sum_{i=0}^{t} \prod_{\tau=0}^{i} Q_\tau^1 \left(\frac{H_i^1 P_{i+1}}{P_i} - Q_i^1 \right) \sum_{j=0}^{\infty} \frac{H_i^{j+1} B_{i+1}^j}{P_{i+1}}$$

But then assume no arbitrage in pricing $$1 = \mathbb{E}_t \left(\frac{m_{t,t+j}}{Q_t^j} \right) = \mathbb{E}_t \left(\frac{m_{t,t+j} P_t}{H_t^j P_{t+j}} \right)$$

EVOLUTION OF DEBT

Budget constraint is first-order Markov

$$W_t = \mathbb{E}_t(m_{t,t+1}W_{t+1}) + s_t$$

This paper assume no debt repurchase/reissue, state space expands in a big way.

$$W_t = s_t + b_t^0$$

Numerical methods. Keep track of distribution of debt maturities over time.

MOREOVER…

Lower bound on debt (also in work before):

$$b_t^j \geq 0$$

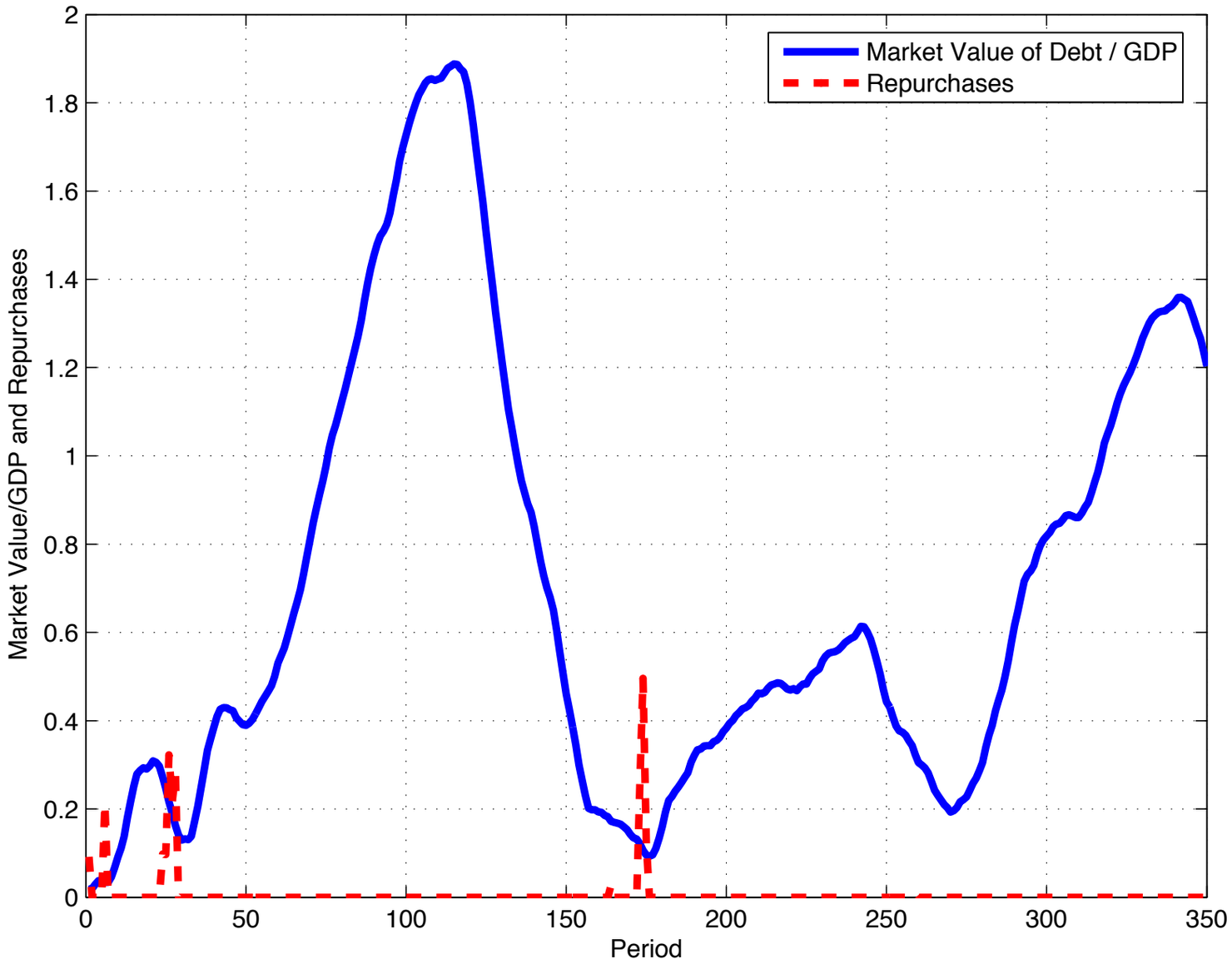
Linear transaction costs in issuances, and in repurchases (baseline above has zero on first, infinite on second), calibrated to match bid ask spreads and market impact.

$$\mathcal{T}^i(b_t^i) = \alpha_0^i + \alpha_1^i b_t^i$$

$$\mathcal{T}^R(R_t) = \alpha_0^R + \alpha_1^R R_t.$$

RESULTS: RARE REPURCHASES

Figure 11: **Model Simulations: Debt to GDP ratio and Repurchases**



Notes: The Figure plots the debt to GDP ratio (solid line) and the absolute level of repurchases (dashed line) in model of Section 6.3. We used the sample of spending as in Figures 6 to 9. The upper bounds imposed on the market value of short and long debt equal 100% of steady state GDP. Hence the market value of total government debt can be as high as 200% of steady state GDP. The lower bounds of short and long bonds are equal to 0.

RESULTS: SHORT DEBT DYNAMICS

		$\overline{\mathcal{S}}_t$ (%)	$\sigma_{\mathcal{S}_t}$ (%)	$\rho_{(\mathcal{S}_{1,t},\mathcal{S}_{1,t-1})}$	$\rho_{\left(\tilde{b}_t^S,\tilde{b}_t^N\right)}$	$\%_{\mathcal{S}_t=0}$	$\%_{\mathcal{S}_t\leq 0.1}$
US DATA		43	7.8	0.94	0.86	0	0
BuyBack							
	'Lend.'	$4{\cdot}10^3$	$3{\cdot}10^5$	0.47	-0.01	-	-
	'No Lend.'	12	13.0	0.86	0.25	13.1%	56.6%
No Buy back							
	'Lend.'	76	$3{\cdot}10^3$	0.42	0.87	-	-
	'No Lend.'	48	8.1	0.92	0.92	0.01%	0.02%
	'No Lend.+Coupons'	51	4.9	0.90	0.94	0.01%	0.02%
	'3 Bonds'	31	5.5	0.81	0.93	0.11%	0.64%
Repurchases+ $\mathcal{T}$ Costs							
	'No Lend.'	45	9.0	0.92	0.93	0.01%	0.01%

Notes: $\mathcal{S}_t$ denotes the share of debt of maturity less than or equal to one year over the total (market value) of debt. $\overline{\mathcal{S}}_t$ represents the average share and $\sigma_{\mathcal{S}_t}$ denotes the standard deviation. The statistic $\rho_{(\tilde{b}_t^S,\tilde{b}_t^N)}$ is the correlation between the market value of short debt and the value of long debt both divided by GDP. The exact definition of the market values, varies depending on the model specification. For example under buyback it holds that $\rho_{(\tilde{b}_t^S,\tilde{b}_t^N)} \equiv \rho(\frac{p_t^S b_t^S}{GDP_t}, \frac{p_t^N b_t^N}{GDP_t})$. Under no buyback and no coupons $\tilde{b}_t^N \equiv \frac{\sum_{i=S+1}^{N} p_t^i b_{t-N+i}}{GDP_t}$. Therefore, when $S=1$ the value of long debt outstanding is the value of all debt which in t is of maturity greater than one year and $\tilde{b}_t^S$ is the market value of all outstanding debt less than one year maturity, divided by GDP. The data counterpart is constructed applying this logic (see text).
$\%_{\mathcal{S}_t\leq x}$ denotes the percentage of times that $\mathcal{S}_t$ is less than or equal to x.
Finally $\mathcal{T}$ denotes the transaction cost function specified in Section 6. See text for details.

RESULTS: WELFARE

- **With no transaction costs**: Small welfare costs of no buybacks alone: 0.4% of consumption.

- **With transaction costs:** utility benefits of buybacks are 14 times smaller than reasonable small transaction costs.

- **Smoothing not such a big deal:** Old menu cost / near rationality / costs of business cycle literatures intuition. Or not?

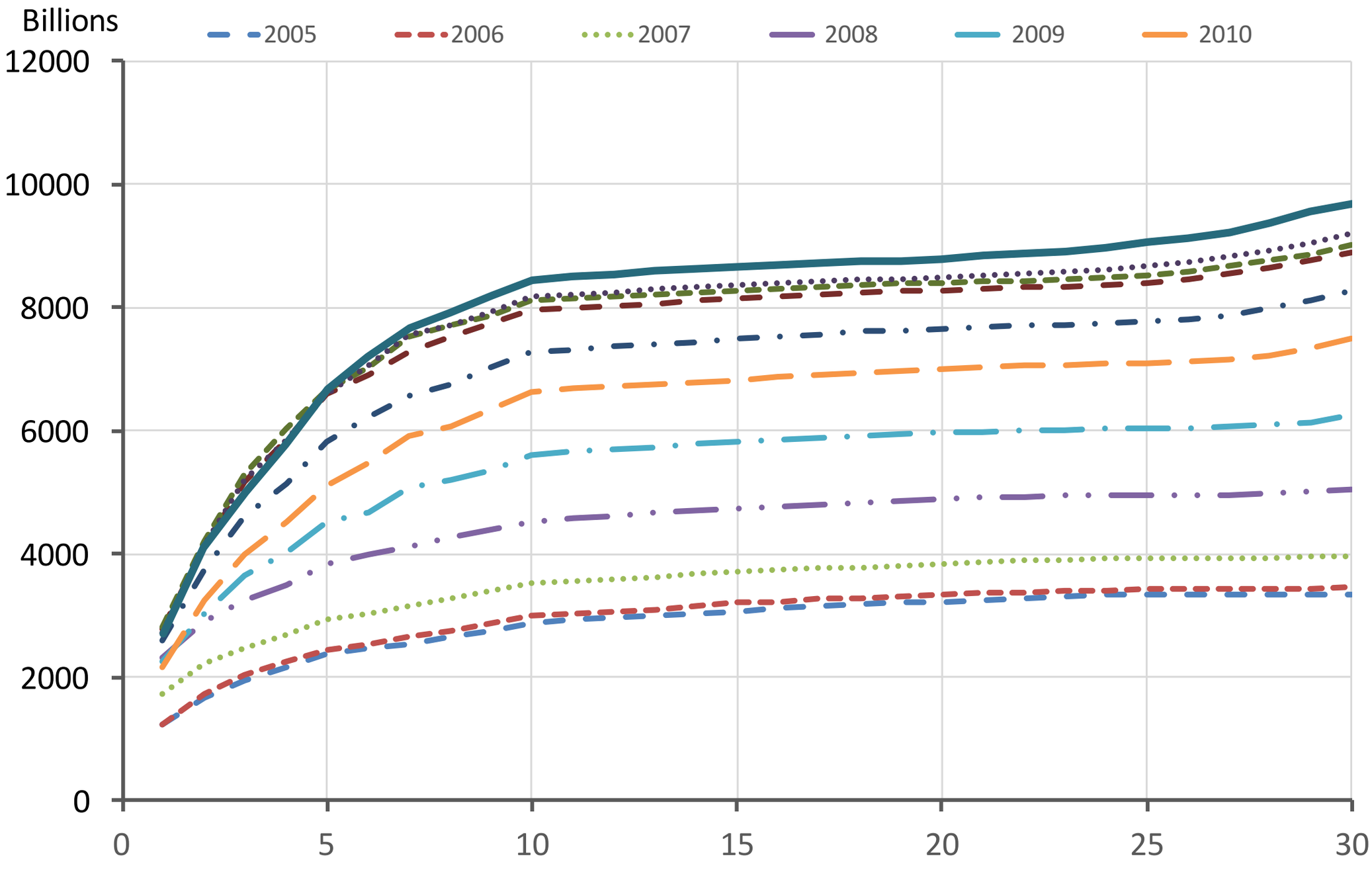
COMMENT: OTHER DRIVERS

Other reasons (models) determining maturity of debt that push for higher short-term debt

- Sovereign default and incentive to repay (Aguiar and Amador, 2016)
- Ability to inflate in persistent way (Hilscher, Raviv, Reis, 2014)
- Long-term debt is expensive (Ellison, Scott, 2017)
- Bond clienteles (Guibaud, Nosbuch, Vayanos, 2013)

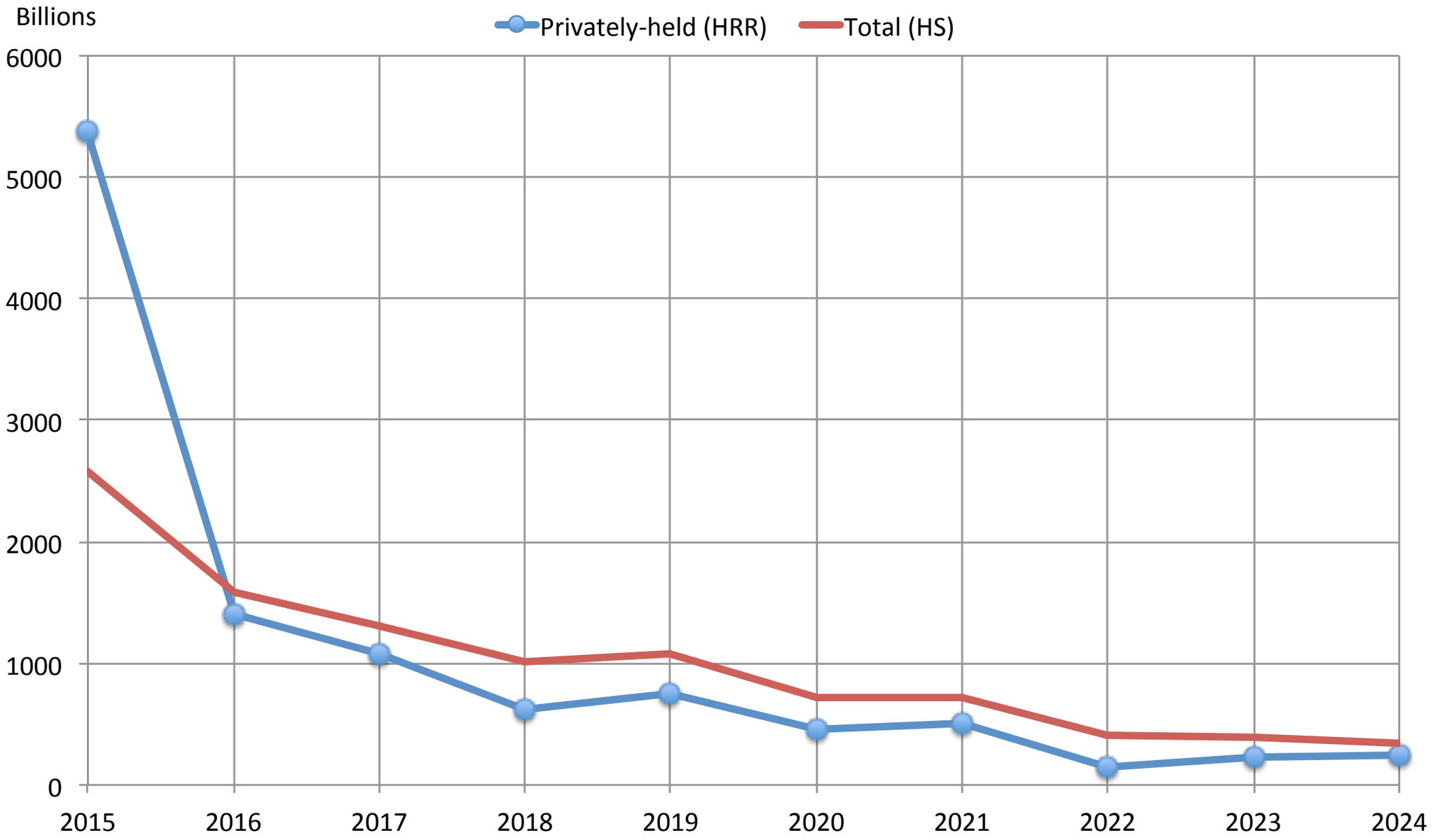
COMMENT: DATA

Panel A. Distribution of maturity of debt



COMMENT: DATA

Figure 2: U.S. public debt in 2015 by maturity



COMMENT: DATA

Government assets

- Corporations, forests, infrastructure. Recent claim, $750 trillion (*Public wealth of nations*, Detter and Folster). Mostly long term, perhaps.

Buybacks when debt is falling

- Expand sample to OECD, are buybacks more frequent?

COMMENT: PRIMARY

- Distinction between primary and secondary markets. Very strong in practice, weak in theory.

- DMOs, and public institutions in general, are very averse to intervene in secondary markets.

- Asymmetric information? Compare with share repurchases.

- Interfere with private allocation? Not if government bonds

- Fear of default and manipulation? Goes the other way.

COMMENT: CENTRAL BANKS

- UK National Debt Inquiry of 1945, and Radcliffe report of 1959. Both charged Bank of England with "managing the debt", buying and selling bonds of different maturities.

- Hahn viewing Radcliffe report: "*..must have and must consciously exercise a positive policy about interest rates, long as well as short, and about the relationship between them.*"

- These are buybacks in all effect. And happened all the time. They are repurchase and reissue. But that do not change overall size of debt. Why ok?

CONCLUSION

- We don't see buybacks. Short-term debt dynamics needs to be explained.

- No buybacks matters for debt management. Constraint is not so costly, but has large effect on dynamics.

- Comment 1: broader literatures.

- Comment 2: measuring *b* is far from easy.

- Comment 3: why no buybacks, secondary markets and the central bank.