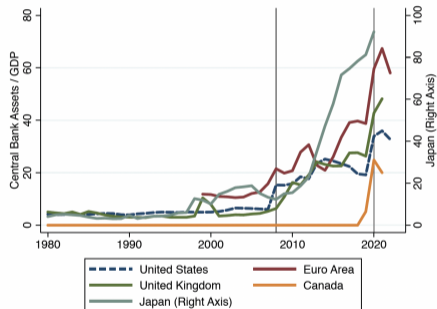# Discussion of "Asset Purchase Rules: How QE Transformed the Bond Market"

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Motivation and Summary

- Q: Is there a QE policy rule rather than one-time policy intervention?

- Importance: parallel to Taylor rule (Taylor 1993), and fiscal policy rule (Bohn 1998).

- Maybe call it "Haddad-Moreira-Muir" rule? Or "HaMoMu" rule?

# Main Results: Dampened Response of Yield Curve to Debt Expansion

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Slope of the Yield Curve				Excess Bond Returns			
	Pre-2007	Full	Full	Full	Pre-2007	Full	Full	Full
ln(MWDGDP)	1.24***	0.53*	1.10***	1.25***	0.11***	0.07**	0.09**	0.11***
	(0.26)	(0.29)	(0.26)	(0.26)	(0.04)	(0.03)	(0.04)	(0.03)
Post 2008 Dummy			-1.74***	1.25			-0.07	0.34
			(0.41)	(1.22)			(0.06)	(0.22)
ln(MWDGDP) × Post				-1.95**				-0.28**
				(0.79)				(0.14)
TBill	-0.32***	-0.22***	-0.30***	-0.28***	-0.00	0.00	0.00	0.00
	(0.04)	(0.05)	(0.04)	(0.04)	(0.01)	(0.01)	(0.01)	(0.01)
Unemp	0.60***	0.41***	0.48***	0.42***	0.01	0.01	0.01	0.00
	(0.08)	(0.08)	(0.06)	(0.06)	(0.01)	(0.01)	(0.01)	(0.01)
Observations	227	288	288	288	227	284	284	284
R-squared	0.73	0.54	0.66	0.69	0.09	0.05	0.06	0.09

- Spillovers to MBS, corporate bond. Option prices.
- Evidence from multiple countries.

Quantification via Vayanos and Vila (2021)

- After introducing QE, long-term yield **negatively** responds to debt supply.

**Panel A**: Loading of Yields on Supply Before and After Rule
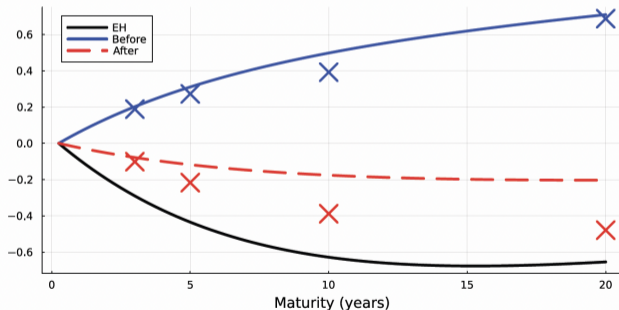
Comments

- The key message is clear and convincing.
  - The promise of QE policy in bad time has tremendous effect in the bond market.

- My main comments are about the magnitude of this impact.
  - Historically, without QE, high debt/GDP is always associated with dampened yield curve response, explaining 60% of the response post GFC.
  - Both fiscal theory and convenience yield demand generate dampening effect with larger debt/GDP.
  - Identification: debt expansion is usually a result of recession, which also leads to lower expectation of future interest rate and flight to safety.

- Exciting broader-picture questions:
  - Can QE create infinite amount of nominal fiscal capacity? How to design QE rule?

Historical Evidence: A Longer-Horizon Sample
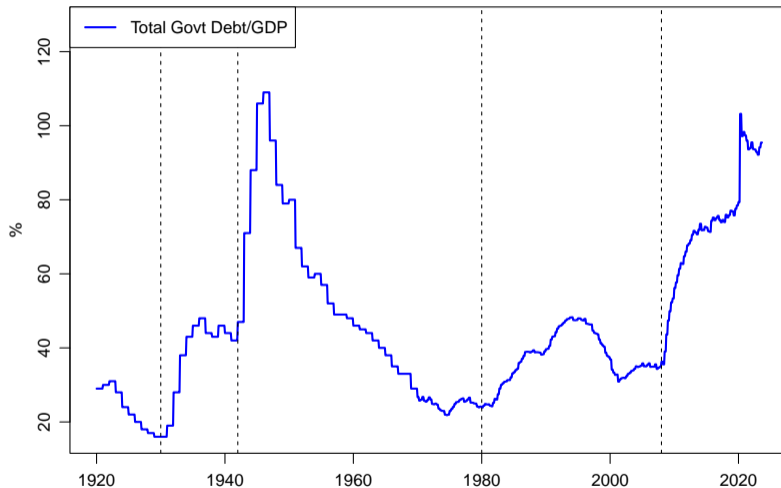
- Data from Cieslak, Li, and Pfluger (2024), Inflation and Treasury Convenience.

Historical Evidence: A Longer-Horizon Sample
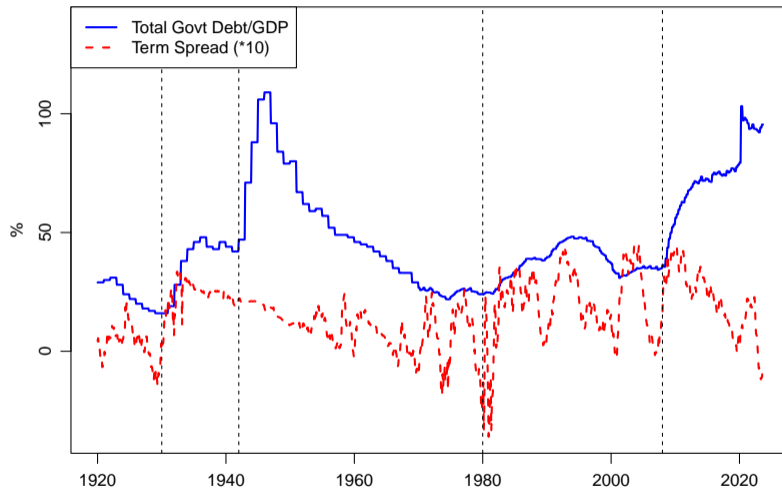
- Data from Cieslak, Li, and Pfluger (2024), Inflation and Treasury Convenience.

Does history present similar phenomenon?

Sample period:	(1) 1920-2023	(2) 1920-1940	(3) 1920-1970	(4) 1970-2000	(5) 1951-2023
			Dependent variable: term spread		
log(DebtToGDP)	0.803*** (0.066)	1.268*** (0.061)	0.391*** (0.057)	5.232*** (0.797)	1.392*** (0.101)
log(DebtToGDP)**post1930**		−1.743*** (0.102)			
log(DebtToGDP)**post1942**			−1.001*** (0.086)		
log(DebtToGDP)**post1980**				−6.798*** (0.893)	
log(DebtToGDP)**post2008**					−5.095*** (0.625)
Tbill 3M rate	−0.140*** (0.011)	−0.731*** (0.018)	−0.503*** (0.012)	−0.529*** (0.020)	−0.235*** (0.013)
Unemployment rate	0.122*** (0.007)	0.040*** (0.004)	0.039*** (0.003)	0.386*** (0.031)	0.477*** (0.018)
Observations	1,245	240	600	348	873
R^2	0.423	0.972	0.909	0.827	0.661

Note: *p<0.1; **p<0.05; ***p<0.01

- Average interaction coef in history is about -3.178 , explaining 62% of the -5.095 result.

High Debt/GDP reduces term spread response to further expansion

- The above analysis reveals that when Debt/GDP becomes higher, the impact of log(Debt/GDP) on term spread becomes smaller.

	Dependent variable: term spread					
	(1)	(2)	(3)	(4)	(5)	(6)
log(Debt/GDP)	0.369***	−2.275***			−2.362***	−2.362***
	(0.082)	(0.232)			(0.233)	(0.233)
log(Debt/GDP)^2		−1.477***			−1.488***	−1.488***
		(0.122)			(0.122)	(0.122)
Debt/GDP			0.175	6.402***		
			(0.175)	(0.665)		
(Debt/GDP)^2				−5.352***		
				(0.553)		
Tbill 3M rate	−0.175***	−0.205***	−0.201***	−0.182***	−0.221***	−0.221***
	(0.013)	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)
Unemployment rate	0.101***	0.073***	0.095***	0.086***	0.079***	0.079***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Inflation					2.270***	2.270***
					(0.750)	(0.750)
Observations	1,245	1,245	1,245	1,245	1,245	1,245
R^2	0.365	0.432	0.355	0.400	0.436	0.436

Note: Sample period is 1920-2023. Statistical significance is $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Plausible Stories for the Historical Phenomenon

- A growing investor base with higher debt supply.
  - Larger debt market attracts more demand, as shown by Dos Santos (2025).

- Catching up of short-term interest rate.
  - At high levels of Debt/GDP, we expect higher short-term interest rate in the future due to inflationary pressure, increasing the term spread.
  - Over time (with high level Debt/GDP), the increase of short-term rate realizes, making term spread effect less pronounced.

- Market expectations of future fiscal policies
  - When Debt/GDP is very high, markets might anticipate a more conservative future fiscal policy that dampens the debt expansion.

- Liquidity effect.
  - As Debt/GDP becomes higher, government debt market becomes deeper and more liquid, reducing the impact of future debt issuance on the term spread.

What about Convenience Yield?

- Convenience yield contributes to $1.084 / 5.095 \approx 20\%$ of the main empirical finding
- Consistent with nonlinear relation between convenience yield and Debt/GDP (Krishnamurthy and Li (2023)).

	(1)	(2)	(3)	(4)	(5)
Sample period:	1920-2023	1920-1940	1920-1970	1970-2000	1951-2023
log(Debt/GDP)	−0.397***	−0.792***	−0.723***	−3.008***	−1.291***
	(0.028)	(0.047)	(0.030)	(0.430)	(0.048)
log(Debt/GDP)*post1930		0.007			
		(0.068)			
log(Debt/GDP)*post1942			0.622***		
			(0.038)		
log(Debt/GDP)*post1980				1.198***	
				(0.422)	
log(Debt/GDP)*post2008					1.084***
					(0.135)
TB3MS	0.005	−0.022**	0.035***	−0.077***	−0.021***
	(0.004)	(0.010)	(0.006)	(0.007)	(0.005)
Unrate	0.016***	0.032***	0.025***	0.062***	0.037***
	(0.003)	(0.002)	(0.002)	(0.010)	(0.006)
Observations	1,245	240	600	348	873
R^2	0.249	0.803	0.830	0.700	0.594

Dependent variable: AAA-Treasury spread

Note: *p<0.1; **p<0.05; ***p<0.01

Classic Theories on Government Debt Supply and the Yield Curve

- In classical macroeconomic models, Ricardian equivalence implies that bond yields are not affected by bond supply.
  - Still so in modern New-Keynesian models.
  - Thus, QE is just a side show.

- In the fiscal theory of price level, a higher government debt supply without fiscal backing increases inflation.
  - It is the ΔDebt/Debt that matters, not ΔDebt/GDP (see also Barro and Bianci (2023)).
  - This leads to a weaker effect of Debt/GDP as debt level becomes higher.

- With convenience yield demand, higher debt supply decreases convenience yield and increases Treasury yields.
  - Most demand specifications indicate dampened effects at high debt/GDP level.

A Demand-Based Framework with Arbitrageurs

- Consider a two-period version of Vayanos and Vila (2021). Then the equilibrium two-period Treasury log price is

$$y_t^{(2)} = \underbrace{\frac{1 + \rho_r}{2(1 + \frac{\alpha}{2}\gamma\sigma_r^2)} r_t}_{\text{expectation}} + \underbrace{\frac{\gamma\sigma_r^2(1 - \theta - \theta^{QE})}{2(1 + \frac{\alpha}{2}\gamma\sigma_r^2)} \beta_t}_{\text{supply}} - \underbrace{\frac{\gamma\sigma_r^2}{2(1 + \frac{\alpha}{2}\gamma\sigma_r^2)} (u_t + \theta_0)}_{\text{demand}}$$

where β_t denotes total long-term debt supply, θ is the investor response to supply and θ^{QE} is the QE response to supply. Term α is demand elasticity and γ is arbitrageur risk aversion.

- QE demand effect reduces the sensitivity of long-term yield $y_t^{(2)}$ to bond supply β_t
  - The sensitivity also decreases when other investors are more responsive to supply (higher θ) and monetary policy is less volatile (low σ_r).
  - Higher α cannot overturn the sign.

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Does Debt Expansion Reduce Long-Term Yield Post-GFC?

Panel A: Loading of Yields on Supply Before and After Rule
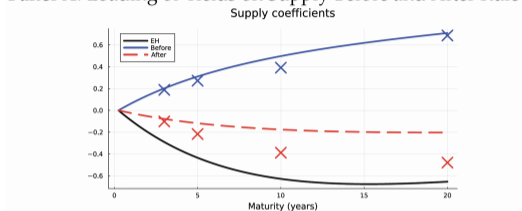
- Post 2008, higher Debt/GDP reduces long-term yield.
- According to the simplified model, this happens if $\theta^{QE} > 1 - \theta$, i.e., Fed soaks up more than the residual supply of debt.
  - ▶ This is not the case in the calibration and data.
- Why does the full model generates negative response?
  - ▶ Monetary policy rate negatively responds to larger debt supply, leading to lower long-term yields.

Debt Expansion is Not Exogenous

- Macro variables (GDP gap, inflation, FFR) can explain 70% of variations in long-maturity Treasury supply.

- The negative response of long-term yield to Treasury supply is confounded with macro dynamics.
  - During recessions, flight to liquidity and increased uncertainty increases preference for Treasuries, depressing long-term yield.
  - During recessions, we expect the Fed to lower rates for certain periods, reducing long-term yields via the expectation hypothesis.
  - Recessions also lead to more government spending.
  - The direct impact of supply on long-term yield is likely dominated by the above confounding effect.

- Need shocks to identify yield curve response to debt supply.
  - Military spending shocks (Choi et al 2024), tax collection shocks (Romer and Romer 2009), primary fiscal surplus shocks (Gomez-Cram, Kung, Lustig 2023) etc.

# Distinguishing Unconditional Expansion v.s. Policy Rule

$$y_t^{(2)} = \underbrace{\frac{1 + \rho_r}{2(1 + \frac{\alpha}{2}\gamma\sigma_r^2)} r_t}_{\text{expectation}} + \underbrace{\frac{\gamma\sigma_r^2(1 - \theta - \theta^{QE})}{2(1 + \frac{\alpha}{2}\gamma\sigma_r^2)} \beta_t}_{\text{loading on supply factor } \beta_t} - \underbrace{\frac{\gamma\sigma_r^2}{2(1 + \frac{\alpha}{2}\gamma\sigma_r^2)} (u_t + \theta_0)}_{\text{demand}}$$

- Note that in this simple model, an unconditional demand change, θ_0, is also effective in changing the equilibrium yield curve.

- To distinguish the QE rule effect, one has to compare an increase of θ_0 (unconditional QE policy) v.s. a higher θ^{QE} (QE rule).
    - In the paper, the comparison is between $\theta^{QE} = 0$ (pre GFC) versus $\theta^{QE} > 0$ (post GFC).

Additional Force: Expectation of QE Persistence

Figure 7. **Impact of QE Shocks on Treasury Yields.**

This figure illustrates how a $100 billion QE shock on different maturity buckets, either temporary (left panel, increasing latent demand u_t) or permanent (right panel, increasing permanent demand θ_0), affects Treasury yields. For dollar values, we use the stationary model unit as described in Section 4.
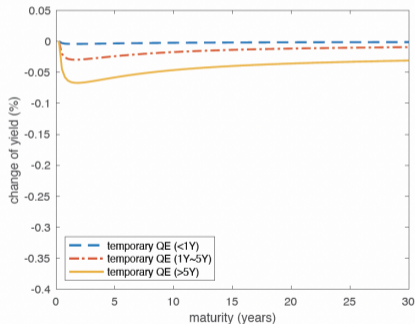
(a) Temporary QE Policy   (b) Permanent QE Policy

Source: Jansen, Li, and Schmid (2024)
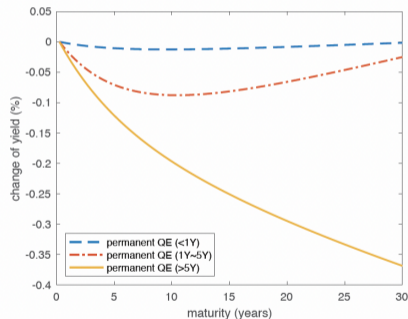
Broader Question: How to Design QE Rule?

- Monetary policy rule: response to inflation and unemployment (Taylor 1993).
  - Tradeoff: employment v.s. inflation.

- Fiscal policy rule: primary surplus response to Debt/GDP for sustainable fiscal policy (Bohn 1998).
  - Tradeoff: paying back now v.s. in the future.

- QE rule: response to Debt/GDP, or broader macro aggregates?
  - What is the tradeoff here? Any downside?
  - Does QE have inflationary effect?
  - Does QE distort asset markets? ......

Broader Question: Slippery Slope of QE?

- Is the Fed balance sheet becoming a political arena?

Summary

- Amazing paper that sheds light to an important question.
  - Parallel to Taylor rule and fiscal rule.

- Story is convincing. Magnitude is subject to debate.

- Elude to exciting broader questions: how to design the QE rule?