SOFR so good? New Benchmark Rate and Crowding-Out Effect

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Background Info

- LIBOR has been the reference interest rate used worldwide in a large variety of financial assets including business loans, consumer loans, and derivatives.
- Due to the LIBOR manipulation scandal and a shrinking interbank debt market, LIBOR is being retired [1]. In the US, the Alternative Reference Rate Committee (ARRC) recommends SOFR as the alternative to the USD LIBOR.
- **LIBOR**: London Interbank Offered Rate
  - LIBOR is the average interest rate that leading banks borrow from each other.
  - It's based on banks' own estimation, not real transactions.
- **SOFR**: Secured Overnight Financing Rate
  - SOFR is a broad measure of the cost of borrowing cash overnight collateralized by Treasury securities.
  - It's based on the real transactions in the overnight Treasury repurchase market.

[1] The publication for one-week and two-month USD LIBOR will cease on December 31, 2021; the publication for the USD LIBOR with other terms will cease on June 30, 2023.

Research Question

Does the change of the benchmark interest rate affect the size of the government debt crowding out effect?

- **Crowding-Out Effect**: Gov't issues more Treasuries $\rightarrow$ Demand for loanable funds increases $\rightarrow$ Interest rate increases $\rightarrow$ Private spending decreases
- Since SOFR is based on transactions collateralized by Treasuries, the economy with SOFR may obtain a different magnitude of crowding-out effect.

Scarce Collateral Channel

- In economy with SOFR, the crowding-out effect can be amplified through the following channel:
  - Gov't issues Treasuries $\rightarrow$ Scarce collateral effect causes a higher demand for borrowings collateralized with Treasuries $\rightarrow$ SOFR rises $\rightarrow$ Business loans become more costly $\rightarrow$ Investment decreases

Business Loans in Total Debt for Nonfinancial Sectors

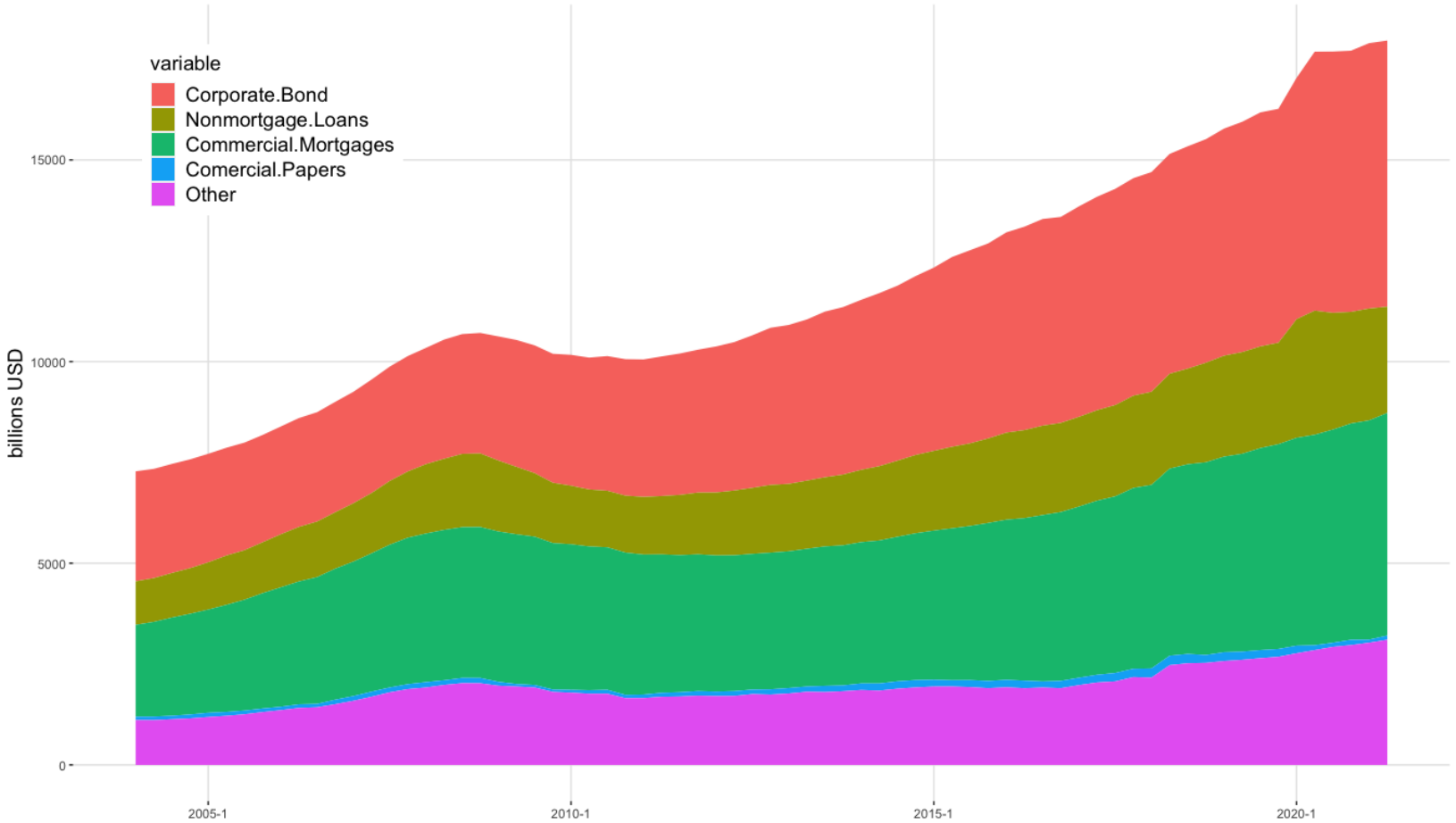


Fig 2: Components of National Business Debts

Business Loans Indexed by LIBOR

A considerable scale of business loans were indexed by LIBOR.

Table 1: Estimated Business Loans Exposed to USD LIBOR

	Volume (Trillions USD)
Syndicated loans	1.5
Nonsyndicated loans	0.8
Commercial mortgages	1.1

Source: Second Report of The Alternative Reference Rates Committee.
Note: Data are gross national exposures as of year-end 2016.
At of year-end 2016, total national nonfinancial business nonmortgage loan is 4.1 trillions of USD and total commercial mortgage is 4.2 trillions of USD.

Banks Picking up SOFR

Leading banks have explicitly or implicitly indicated that they will pick up SOFR as the replacement for LIBOR.

- **JPMorgan Chase**: All new loan financings, such as for mergers and acquisitions that JPMorgan is underwriting are being tied to SOFR if they are expected to price next year, said Kevin Foley, the bank's global head of capital markets. (Financial Times)
- **BOA**: Grabenstein added Wells Fargo has not "put a total stop on LIBOR loans, but we are going to the customer with SOFR first and only if there is a real need to use LIBOR should it still be considered." (Financial Times)
- **U.S. Bank**: U.S. Bank became operationally ready to offer SOFR for most commercial loans. (U.S.Bank website)
- **Truist**: At Truist we offer SOFR as an alternative rate for commercial loans...(Truist website)
- **TD Bank**: For LIBOR indexed loans with tenors after the anticipated phase-out date, we plan to offer three SOFR varieties based on customer preference or appropriateness as alternatives to LIBOR after the phase-out date. (TD Bank website)

OLS: SOFR and Gov't Debt

- Regress SOFR and LIBOR spread over FFR on government debt outstanding.

Table 3: Response of SOFR and LIBOR to Government Debt Issuance

	Dependent variable:			
	SOFR spread		LIBOR spread	
	(1)	(2)	(3)	(4)
Government debt	614.474***	609.553***	−36.676	−34.162
	(166.458)	(169.146)	(23.319)	(22.558)
Lagged SOFR		0.173**		
		(0.078)		
Lagged LIBOR				−0.163**
				(0.066)
Constant	−0.276***	−0.242***	0.008	0.008
	(0.088)	(0.068)	(0.010)	(0.011)
Adjusted R^2	0.0405	0.0696	0.0026	0.0283
Observations	1135	1134	1100	1082

Note: *p<0.1; **p<0.05; ***p<0.01
All variables are in diff log format.
Newey-West Standard Error in parenthesis.
The sample includes daily data from August 25, 2014 to December 31, 2019.

- The results show that issuing government debt is correlated with higher SOFR level while it has no significant effect on LIBOR.

LP: Effect of Gov't Borrowing Shock

Two Steps:

- Compute government borrowing shocks

$$b_t = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + A(L)X_{t-1} + \epsilon_t^b$$

  - b_t: log(govt debt)
  - X_t: controls including six lags of log(govt debt), log(industrial production), and log(stock price)
  - $\hat{\epsilon}_t^b$: identified borrowing shock

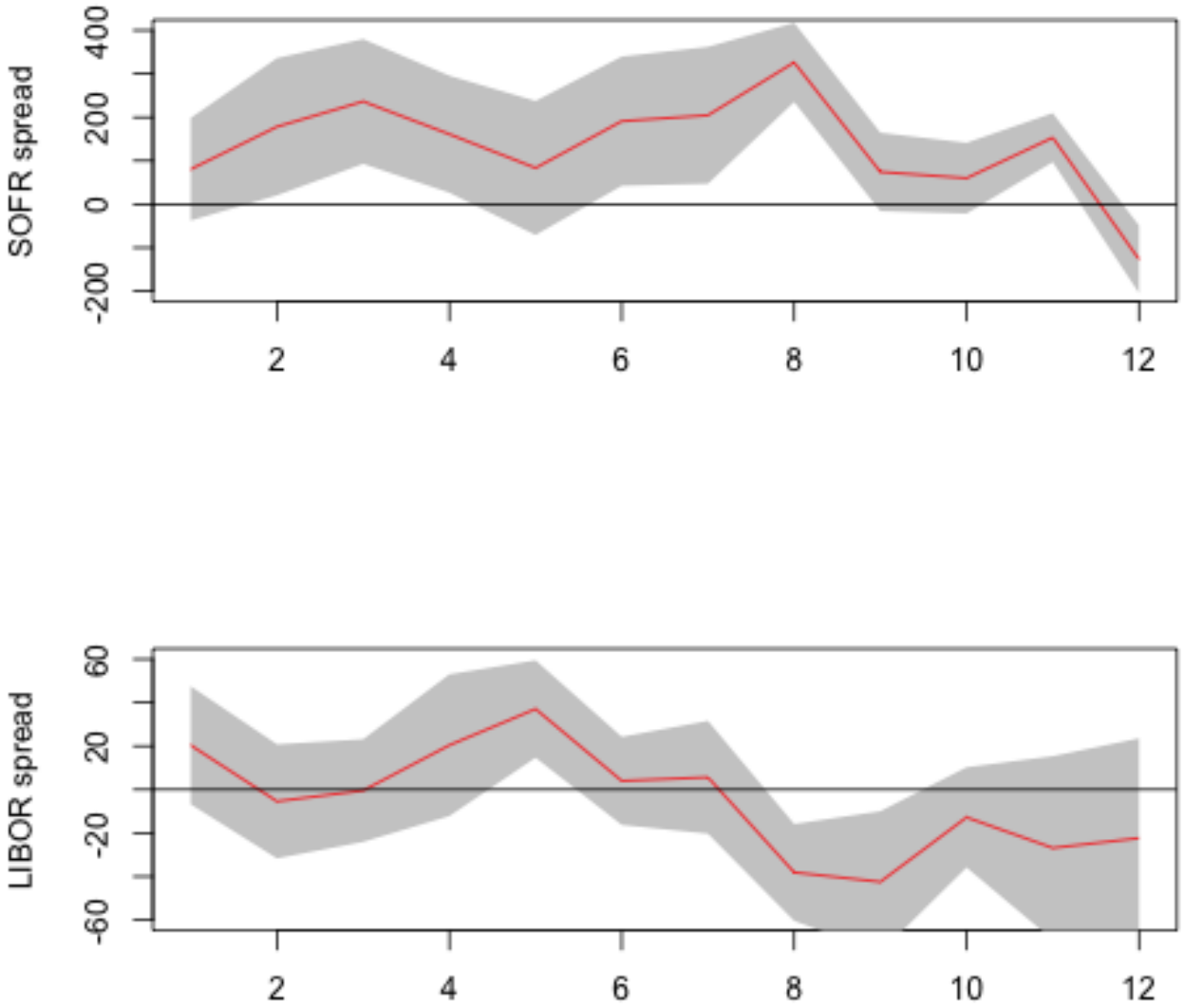
- Estimate local projections

$$r_{t+h} = \beta_0 + \psi_h \hat{\epsilon}_t^b + \Gamma(L)Z_{t-1} + u_{t+h}$$

  - r_{t+h}: SOFR or LIBOR spread at horizon h
  - Z_{t-1}: controls including three lags of SOFR or LIBOR spread, log(govt debt), and log(industrial production)

LP: Results

IRFs of Government Borrowing Shock



Model

- An RBC model with financial frictions based on Walque, Pierrard, and Rouabah (2010).
- The direct borrowing between firms and households is not feasible, funds must flow through an interbank lending market.
- Deposit banks demand deposits from households, they lend to commercial banks through the interbank lending market.
- In economy under SOFR, commercial banks borrow from deposit banks through the interbank market using government bonds as collateral.
- Firms borrow uninsuredly from the merchant banks for business capital.
- Commercial banks and firms are allowed to default, while deposit banks cannot default.

Households

- Households choose consumption C_t and deposits D_t to maximize their expected lifetime utility subject to flow budget constraint.
- They receive labor income $w_t N$ and pay lump-sum tax T_t.
- They own deposit banks, commercial banks, and firms.

$$\max_{\{c_t, D_t\}} E \sum_{t=0}^{\infty} \beta^t log C_t, \tag{1}$$

$s.t.$

$$C_t + \frac{D_t}{1 + r_t} + T_t = w_t N + D_{t-1} + d_t^D + d_t^C + d_t^F \tag{2}$$

Deposit Banks

- Deposit banks choose deposit demand D_t and interbank lending supply I_t to maximize profits.
- Interbank lending requires collateral in the form of government bonds B_t. For the part of lendings on which the merchant banks choose to default $(1-\gamma_t^I)$, the deposit banks will recover a fraction θ of the collateralized assets.

$$\max_{\{D_t, I_t, d_t^D\}} E \sum_{t=0}^{\infty} \{M_t d_t^D\}, \tag{3}$$

$s.t.$

$$d_t^D = \gamma_t^I I_{t-1} + \frac{D_t}{1+r_t} - D_{t-1} - \frac{I_t}{1+r_t^I} + \theta(1-\gamma_{t-1}^I) I_{t-2}, \tag{4}$$

$$\tag{5}$$

Commercial Banks

- Commercial banks choose interbank lending demands I_t, government bonds holding B_t, business loan supply L_t, and repayment rate γ_t^I to maximize its profits.
- Interbank borrowing features a collateral requirement. There is no haircut for government bonds as a collateral.To simplify the problem, it's assumed that commercial banks borrow at their limit.
- Two types of default costs: (1) a fraction θ of collateral is forfeited; (2) non-pecuniary cost $\xi_C(1-\gamma_t^I)$.

$$\max_{\{I_t,B_t,L_t,\gamma_t^I,d_t^C\}} E\sum_{t=0}^{\infty}\{M_t d_t^C\}, \tag{6}$$

$s.t.$

$$d_t^C = \gamma_t^L L_{t-1} + \frac{I_t}{1+r_t^I} - \gamma_t^I I_{t-1} - \frac{L_t}{1+r_t^L} - \theta(1-\gamma_{t-1}^I)I_{t-2} - \xi_C(1-\gamma_t^I) + B_{t-1} - \frac{B_t}{1+r_t^B}, \tag{7}$$

$$I_t = B_t \tag{8}$$

Firms

- Firms choose labor demand N_t, business loan demand L_t, and repayment rate γ_t^L to maximize profits.
- They can default on business loans with a non-pecuniary cost $\xi_F(1-\gamma_t^L)$.

$$\max_{\{N_t, L_t, \gamma_t^L, d_t^F, K_t\}} E \sum_{t=0}^{\infty} \{M_t d_t^F\}, \tag{9}$$

$s.t.$

$$K_t = (1-\delta)K_{t-1} + \frac{L_t}{1+r_t^L}, \tag{10}$$

$$d_t^F = F(K_t, N_t) - w_t N_t - \gamma_t^L L_{t-1} - \xi_F(1-\gamma_t^L) \tag{11}$$

Gov't Budegt Constraint

$$G_t + B_{t-1} = \frac{B_t}{1 + r_t^B} + T_t \tag{12}$$