Bank Runs and Interest Rates: A Revolving Line Perspective

Falk Bräuning and Victoria Ivashina

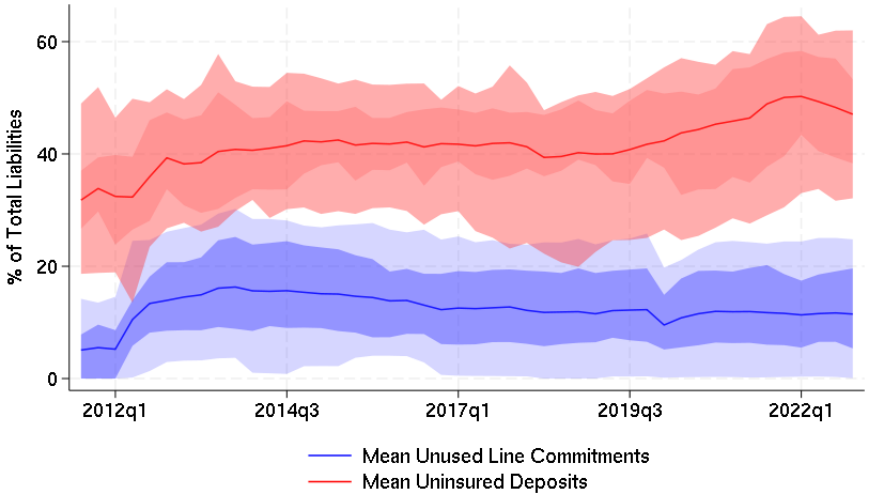
Federal Reserve Bank of Boston and Harvard Business School

ECB Annual Research Conference
September 17, 2025

Most businesses have a revolving line of credit

- In a regular course of business, revolving lines (RLs) are used to:
  - Manage working capital
  - Pursue growth through acquisitions

Banks' exposure to committed but undrawn commercial credit lines is sizable



Research question

- This paper focuses on commercial credit lines as demandable (runable) claims that have been shown to contribute to bank liquidity squeezes
- Our key point is that—unlike deposits runs—the risk of revolver runs decreases with higher interest rates
  - Stabilizing factor in the 2023 context

Interest rate on RLs is variables

- If unused/udrawn: Fixed fee
- If used/drawn: Interest rate= Base rate + Fixed spread

Fixing the ideas

- Two periods, three dates: $t = 0, 1, 2$
- Positive NPV project, with return $f(I) = \theta \log(I)$, requires investment in $t = 1$, funded with credit line, issued in $t = 0$ and maturing in $t = 2$

Fixing the ideas

- Two periods, three dates: $t = 0, 1, 2$
- Positive NPV project, with return $f(I) = \theta \log(I)$, requires investment in $t = 1$, funded with credit line, issued in $t = 0$ and maturing in $t = 2$
- Interest rate on drawn part is r^l (0 interest on undrawn part)
- Precautionary drawn funds are held in insured deposit account and remunerated at rate $r^d < r^l$

Fixing the ideas

- Two periods, three dates: $t = 0, 1, 2$
- Positive NPV project, with return $f(I) = \theta \log(I)$, requires investment in $t = 1$, funded with credit line, issued in $t = 0$ and maturing in $t = 2$
- Interest rate on drawn part is r^l (0 interest on undrawn part)
- Precautionary drawn funds are held in insured deposit account and remunerated at rate $r^d < r^l$
- With probability p, the bank fails (exogoneously) in $t = 1$ cutting firm off from credit access prior to investment

Optimization problem

- The firm maximizes expected profits, π, by choosing the precautionary drawdown (early line utilization) u at $t = 0$ and the residual drawdown l at $t = 1$:

$$\max_{u,l} \pi = (1 - p) \left(\log(u + l) + (r^d - 2r^l)u - r^l l \right) + p \left(\log(u) + (r^d - 2r^l)u \right)$$

Optimization problem

- The firm maximizes expected profits, π, by choosing the precautionary drawdown (early line utilization) u at $t = 0$ and the residual drawdown l at $t = 1$:

$$\max_{u,l} \pi = (1-p)\left(\log(u+l) + (r^d - 2r^l)u - r^l l\right) + p\left(\log(u) + (r^d - 2r^l)u\right)$$

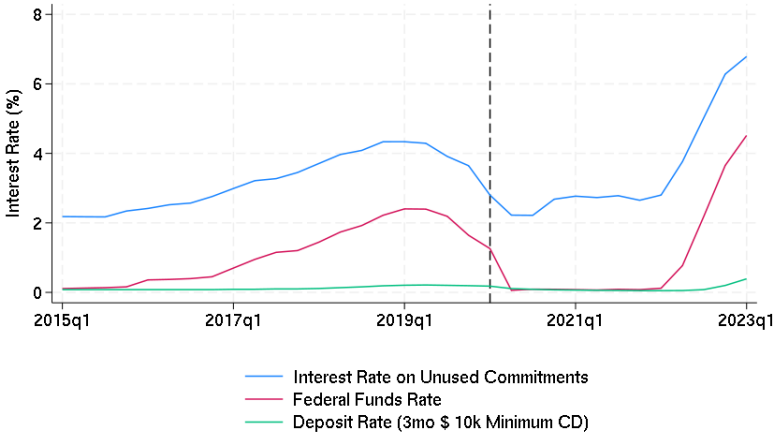
- Optimal precautionary drawdown given by

$$u = \frac{p\theta}{(1+p)r^l - r^d}$$

- Precautionary drawdowns decrease when interest rates increase:

$$\frac{\partial u}{\partial r^l} = -\frac{\theta p(1+p)}{\left((1+p)r^l - r^d\right)^2} < 0$$

Interest rate on drawn RLs, Fed Funds Rate, and deposit rate



Note: Deposit rate is the average deposit rate on 3-month certificates of deposits with a minimum balance of $10k. The vertical red line indicates 2020q1.

Data

- FR Y-14Q, Schedule H
  - Loan level
  - Quarterly
  - Sample starts in 2015 (technically starts in 2011, but early years poorer quality)
  - Large banks (data supports supervisory stress test models)
  - All outstanding RLs with at least $1 million commitment
    - As of 2019, 70% of CI loans held by US banks
  - Data contains detailed loan and borrower characteristics including committed amount, line utilization, interest rate, spread, base, etc.
- FFIEC 031 ("Call reports")

Identification challenges

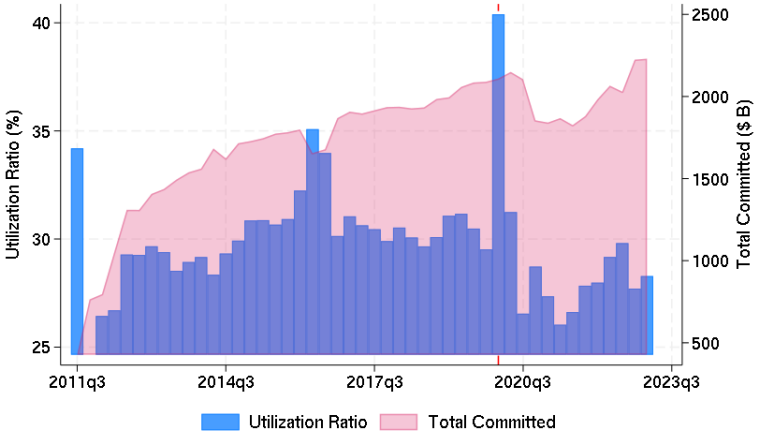
- We can't just regress usage of revolving lines on the base rate:
  - Interest rates are endogenous (and data start in 2015)
  - We need a setting where precautionary (vs. fundamental) drawdowns are plausible

Identification challenges

- We can't just regress usage of revolving lines on the base rate:
  - Interest rates are endogenous (and data start in 2015)
  - We need a setting where precautionary (vs. fundamental) drawdowns are plausible

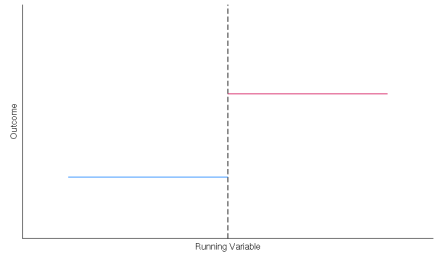
- Solution:
  - We apply regression kink design (RKD) a la Card et al. (2015, 2016)
  - We focus on 2020 draw downs (2019q4-2020q4)

Utilization of revolving lines over time

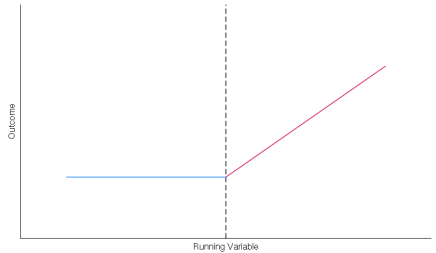


Regression Kink Design/RKD

- We tackle endogeneity of interest rates using the regression kink design (RKD) Card et al. (2015, 2016), and Indarte (2023).
- RKD is similar to Regression Discontinuity Design (RDD) but jump happens in first derivative of outcome variable instead of function itself



(a) RDD



(b) RKD

RKD works because of relevance of interest rate floors

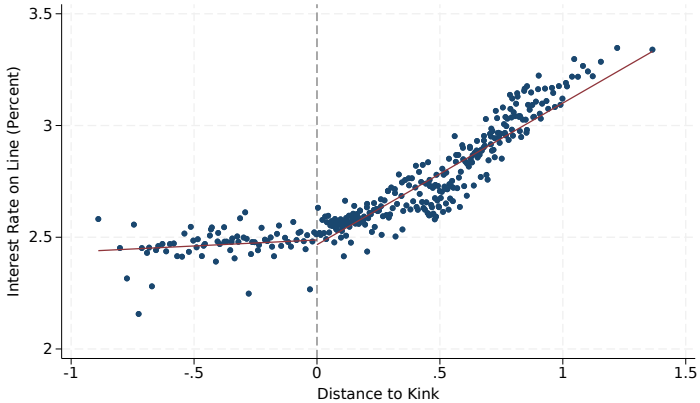
- Once drawn, borrower pays variable rate linked to index (till recently LIBOR) rate

$$r_{l,t} = \text{Spread}_l + \max(\text{LIBOR}_t, \text{Contracted LIBOR floor}_l).$$

- Distance to implied interest floor: $d_{l,t} \equiv \text{LIBOR}_t$ - Contracted LIBOR $\text{floor}_{l,t}$
  - Running variable or forcing variable in terms of the RKD terminology.
- Thus:

$$r_{l,t} = \begin{cases} \text{All-in spread}_l + \text{LIBOR}_t & \text{if } d_{l,t} \geq 0 \\ \text{All-in spread}_l + \text{Contracted LIBOR floor}_l & \text{if } d_{l,t} < 0 \end{cases}$$

Kink in applicable credit line interest rate



Sources: FR Y-14Q, Haver, authors' calculations.

RKD estimand (Local Average Treatment Effect)

- Line utilization is a function of $d_{l,t}$, other variables $\alpha_{l,t}$, and parameters θ:

$$u_{l,t} = u_{l,t}(d_{l,t}) = u(d_{l,t}, \alpha_{l,t}; \theta)$$

- Key assumption: u is smooth in α at threshold (d doesn't have to be exogenous)

Baseline results

	(1)	(2)	(3)
Panel A: Interest Rate Elasticity			
Elasticity	-12.66***	-9.18***	-8.18**
	(1.88)	(3.21)	(3.94)
Panel B: Dep. Var. is Interest Rate			
Distance to Floor	0.463***	0.532***	0.559***
	(0.032)	(0.042)	(0.049)
At Floor * Distance to Floor	-0.476***	-0.515***	-0.537***
	(0.031)	(0.052)	(0.067)
Panel C: Dep. Var. is Utilization Rate			
Distance to Floor	-2.047*	-1.724	-1.167
	(0.667)	(1.538)	(1.523)
At Floor * Distance to Floor	6.025***	4.724*	4.396
	(0.802)	(1.580)	(2.045)
Controls	Yes	Yes	Yes
Facility FE, Time FE	Yes	Yes	Yes
Bank*Time FE	No	Yes	Yes
Industry*Time FE	No	No	Yes
N	20198	20188	20170

Focusing on firms with more pronounced precautionary drawdown motives

	Borrowers with Precautionary Drawdown?			
	Definition 1		Definition 2	
	No	Yes	No	Yes
	(1)	(2)	(3)	(4)
Elasticity (No COVID)	-21.20***	-20.98***	-20.72***	-24.26***
	(3.77)	(4.52)	(3.18)	(4.98)
Between-Group Diff	-0.23		3.54	
	(0.962)		(0.519)	
Elasticity (COVID)	-6.02**	-13.60***	-7.16**	-13.37***
	(3.05)	(3.25)	(3.13)	(4.39)
Between-Group Diff	7.57**		6.21	
	(0.020)		(0.275)	
COVID Effect:	-15.18***	-7.38	-13.56***	-10.89*
(p-value)	(0.002)	(0.185)	(0.002)	(0.098)

Notes: Precautionary drawers (Def 1=Yes): a firm that increased its utilization in 2020q1 by more than the median firm, and in 2020q2 reverts back to its 2019q4 utilization (within a 5 percentage point margin). Def 2 does the same but the threshold is based on the 2020q1 median utilization change by

Financial Stability Implications

Financial Stability Implications

- Relate deposit flow betas to "RL utilization" betas in the cross-section

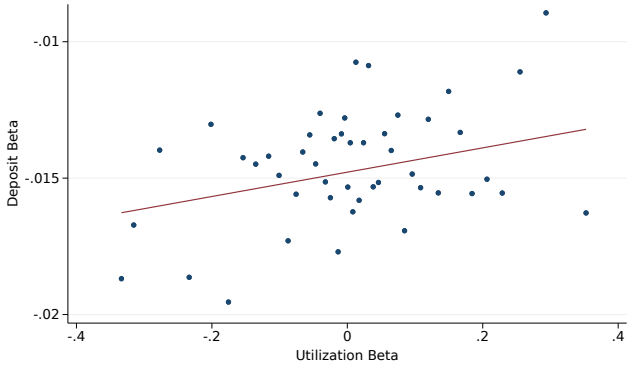
Financial Stability Implications

- Relate deposit flow betas to "RL utilization" betas in the cross-section
- Call Report data
  - Broader set of banks
  - Longer time period (2001:Q1-2024:Q3)
  - Proxy for credit line utilization: utilization of RLs and term loan—as a percent of total credit (used and unused)
  - Not conditional on strong precautionary motive

Financial Stability Implications

- Relate deposit flow betas to "RL utilization" betas in the cross-section
- Call Report data
  - Broader set of banks
  - Longer time period (2001:Q1-2024:Q3)
  - Proxy for credit line utilization: utilization of RLs and term loan—as a percent of total credit (used and unused)
  - Not conditional on strong precautionary motive
- Interpretation:
  - Low deposit beta: higher rate $\rightarrow$ *higher* outflows of deposits
  - Low RL utilization beta: higher rate $\rightarrow$ *lower* drawdown of RLs

Correlation of "deposit beta" and "line utilization beta" suggests that interest rate risks of the two demandable claims partially offset



Notes: Binned scatter based on bank-level betas. Betas are estimates of $\sum_{\tau=0}^{3} \beta_{i,\tau}$, à la Drechsler et al: $\Delta y_{i,t} = \alpha_i + \eta_t + \sum_{\tau=0}^{3} \beta_{i,\tau} \Delta FF_t + \epsilon_{i,t}$, y = log(deposits) or utilization rate proxy, using call reports. *Sources:* FFIEC 031, Haver, and authors' calculations.

Conclusion

- Revolving lines represent sizable demandable claims on banks
- But unlike deposits, drawdowns are highly interest sensitive
- This has several implications:
  - Rates are often sharply lowered in response to a negative economic shock $\rightarrow$ increase in RL run probability
  - In 2023 (high rate environment), this feature likely prevented pressure on bank liquidity from revolver runs