Suboptimal lending with deposit insurance

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This paper investigates how deposit insurance affects lending, combining insights from theory and data.

The traditional view holds that deposit insurance leads to risk-shifting and overlending. Empirical studies attempting to detect moral hazard build on this framework, assuming that more lending directly indicates greater moral hazard. In practice, the link is more nuanced.

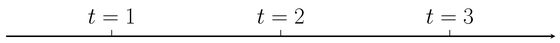
This paper makes two main contributions:

1) Develops a model showing that expanding deposit insurance can lead to either overlending (funding negative-NPV loans) or underlending (passing up positive-NPV loans). The outcome depends on a bank's funding mix and the elasticity of deposits.

2) Empirically tests the model's predictions, finding that the insured deposit ratio is positively related to lending for deposit-funded banks (overlending), and negatively related for wholesale-funded banks (underlending via overhang).

Model

Setup



Allocate deposits d to loans x_1 and liquidity y.

Wp p, choose new loans x_2.

State A realizes. Sell assets to repay c to funding providers.

Fixed deposits; uncertain new lending opportunity. Bank chooses x_1 and x_2 to maximize shareholder value:

$$\Pi \equiv p \cdot \left[A\left(x_1 + X(x_2)\right) + y^+ - c\right]^+ + (1-p) \cdot \left[Ax_1 + y^+ - c\right]^+$$

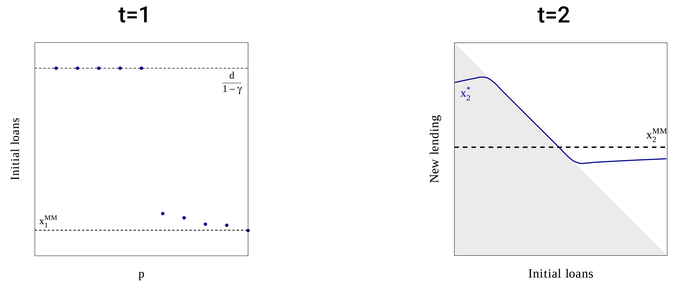
s.t.

Regulation (deposit insurance, capital requirements)
Funding providers' breakeven conditions

Regulation

Proportion of insured deposits at the bank: Δ
Capital requirement: $k_t \geq \gamma x_t$

Model results



The model is solved by backward induction.

In $t = 2$, the bank chooses x_2 if new lending opportunity materializes:

- No deposit insurance ($\Delta = 0$): optimal choice x_2^{MM}.
- Deposit insurance ($\Delta > 0$) makes deposits cheaper, introducing a distortion:
  - If the marginal funding is **deposits** ⇒ **overlending** ($x_2^* \geq x_2^{MM}$).
  - If the marginal funding is **wholesale** ⇒ **underlending** ($x_2^* \leq x_2^{MM}$).

In $t = 1$, the bank chooses x_1 knowing that new lending opportunity will materialize wp p:

- The bank doesn't set aside enough liquidity in $t = 1$ as long as there is uncertainty.
- As a result, if the lending opportunity materializes in $t = 2$, the bank must turn to wholesale funding and underlends.

Empirical application

The empirical application tests level and marginal predictions from the model using U.S. banks data and the 2023 Regional Banking Crisis shock.

Level prediction

Deposit-funded banks:

$$\frac{\partial x^D}{\partial \Delta} > 0$$

Non-deposit-funded banks:

$$\frac{\partial x^{ND}}{\partial \Delta} < 0$$

⇒ The coefficient for the insured deposit ratio is *positive* when the bank is deposit-funded; and *negative* when the bank is non-deposit-funded.

	Loan-to-Deposit				Total loans (log)			
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sub-sample:	All	Deposit	Non-deposit	All	All	Deposit	Non-deposit	All
Δ_{t-1}	-0.01	0.14**	-0.22**		-0.01	0.16*	-0.28**	
	(0.05)	(0.06)	(0.09)		(0.08)	(0.08)	(0.14)	
$\Delta_{t-1} \times I_{ND}$				-0.14*				-0.28**
				(0.08)				(0.12)
$\Delta_{t-1} \times I_D$				0.04				0.17**
				(0.06)				(0.08)
$Assets_{t-1}$					0.95***	0.97***	0.90***	0.95***
					(0.03)	(0.04)	(0.07)	(0.03)
Year-Quarter (41)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Bank	509	178	144	509	509	178	144	509
Observations	13,871	4,332	4,227	13,871	13,908	4,332	4,264	13,908
R^2	0.88	0.90	0.88	0.89	1.00	0.99	1.00	1.00

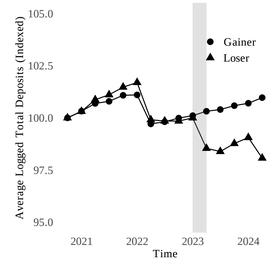
Clustered (Bank) standard-errors in parentheses | *Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Note: Δ_{t-1} is the insured deposit ratio in the previous quarter. I_D is an indicator variable that equals 1 if the bank is deposit-funded, a bank is classified as deposit-funded if their deposit/liability ratio exceeds the 66th percentile at least half of the time. I_{ND} is an indicator variable that equals 1 if the bank is non-deposit-funded, a bank is classified as non-deposit-funded if their deposit/liability ratio is below the 33rd percentile at least half of the time. A one-standard deviation increase in the insured deposit ratio is associated with a 238 basis points (0.17×0.14) increase in the Loan-to-Deposit ratio for deposit-funded banks and a 374 basis points (0.17×-0.22) decrease in non-deposit-funded banks.

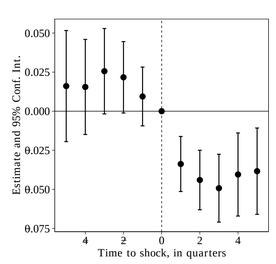
Marginal prediction

$$\frac{\partial^2 x}{\partial d \partial \Delta} > 0$$

⇒ In the aftermath of the 2023 Regional Banking Crisis, some banks suddenly lost access to a marginal source of funding that was subsidized: deposits. The model predicts that in such conditions, "overhang" becomes the dominant effect.



Note: The reference date for the index is June 30th, 2020. 'Loser' refers to banks with a negative quarter-on-quarter change in total deposits from December 31st, 2022 to March 31st, 2023. Conversely, 'gainer' refers to banks that had a positive quarter-on-quarter change in total deposits from December 31st, 2022 to March 31st, 2023. Silvergate Capital Corporation, Signature Bank, and Silicon Valley Bank were excluded from the sample. There are 198 'losers' and 169 'gainers' in the sample.



Note: The figure displays the coefficient estimates from the event study specification: $loans_{i,t} = \alpha + \sum_{t=-5}^{t=5} \mu_t \cdot \tau_t \cdot Loser_i + f_i + f_t + \epsilon_{i,t}$ where $loans_{i,t}$ is the logarithm of total loans for bank i at time t, τ_t is an indicator variable for each time period t relative to the last quarter before the shock, i.e. December 31, 2022. $Loser_i$ is a dummy variable equal to 1 for banks that lost deposits and 0 otherwise; f_i and f_t represent time and bank fixed effects, respectively, and $\epsilon_{i,t}$ is the error term.

Conclusion

Deposit insurance can generate both **overlending** and **underlending**, with underlending through overhang emerging as a key and **policy-relevant** consequence.

The model shows that the moral hazard effects of deposit insurance depend on funding structure and deposit elasticity. When marginal lending is funded by **deposits**, moral hazard manifests as **overlending**. When it is funded by **wholesale funding**, which in the model is justified by stickiness in deposit provision and uncertainty in the realization of the lending opportunity, the bank faces an overhang problem that leads to **underlending**.

The **empirical evidence** aligns with these predictions. For deposit-funded banks, a higher insured deposit ratio is associated with overlending. For wholesale-funded banks, the relationship is negative, consistent with underlending through overhang. An event study of the **2023 Regional Banking Crisis** — when some banks abruptly lost access to their subsidized funding source, deposits — confirms the mechanism: deposit-losing banks curtailed lending, consistent with overhang.

Thank you for your attention!

Find out more in the full paper.