Destabilizing Digital "Bank Walks"

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- Traditionally, the sleepiness of deposits was associated with their insensitivity to risk up to a point, followed by runs
- We are focusing on the inertia to changes in their opportunity cost, and to what extent the digitalization of the banking relationship changes this inertia

Question

How has the digital (website + mobile) transformation of banking over the last decade changed...

- ... the stickiness of deposits and deposit betas?
- ... banks' deposit franchise value, and by how much?

This Paper

As the Fed funds rate increases, digital banks experience

1. Larger outflow of deposits
2. Larger increase of deposit rates (Higher deposit betas)
3. 40% lower value of the deposit franchise

Literature Review

1. Deposit Betas:
   - Berger & Hannan (1989), Diebold & Sharpe (1990), Hannan & Berger (1991), Neumark & Sharpe (1992), Hutchison & Pennacchi (1996), Driscoll & Judson (2013), Drechsler, Savov, & Schnabl (2017, 2021)
   - Emphasis on technology rather than competition
2. Financial Stability
   - Egan, Hortacsu, & Matvos (2017), Jiang, Matvos, Piskorski, & Seru (2023), Acharya, Chauhan, Rajan, & Steffen (2023), Drechsler, Savov, Schnabl, & Wang (2023)
   - "Deposit walks" versus deposit runs
   - The effect of digitalization on deposit franchise value
3. Digital Banking
   - Stulz (2019), Hong, Lu, & Pan (2019), Jiang, Yu, & Zhang (2022), Haendler (2022), Curi, Lozano-Vivas, & Murgia (2023), Erel, Liebersohn, Yannelis, & Earnest (2023), Koont (2023)

Road Map

1. Definitions
2. Data
3. Results
    I. Deposit outflows
    II. Deposit betas
    III. Deposit franchise value

1. Definitions

- Digital Banks: banks that have a mobile banking platform with at least 300 reviews
- Brokers: banks that report non-zero brokerage income in a given year in their Call Reports

Table 1: Digital Platforms in 2022

	Number	% of Total	Mean Assets ($B)	Median Assets ($B)
Number of banks	4,529		3.42	0.23
Digital Banks	1,096	23%	12.55	0.69
Broker	404	9%	30.75	1.78
Digital Brokers	257	5%	46.82	3.17

2. Data

- Banks
  - Digital platform data (Koont 2023) and brokerage classification (Call reports)
  - Bank-level deposit and interest expense data (Call reports)
  - Branch-level deposit quantities (FDIC SOD), and rates (RateWatch)
  - Marked-to-market losses in 2022 (Jiang, Matvos, Piskorski, & Seru 2023)
- Local Counties
  - Internet subscriptions by county (Census American Community Survey 2019)
- Aggregate Trends
  - Fed funds rate, deposits, GDP (FRED)

3.I Results: Deposit Outflows – Time Series 1971-2023

Deposits as a share of GDP have become more sensitive to changes in the Fed funds rate

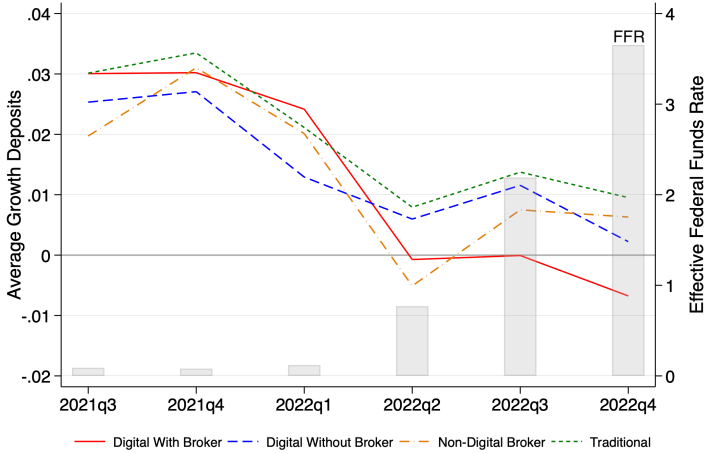
$$\Delta\left(\text{Deposits/GDP}\right)_{t,t-1} = \beta_0 + \beta_1 \times \Delta FFR_{t,t-1} \times \text{Decade}_t + \varepsilon_t, \quad t = \textit{quarter}$$

	Change in Deposits/GDP
Δ FFR × 1970s	-0.000
	(0.001)
Δ FFR × 1980s	0.001
	(0.000)
Δ FFR × 1990s	-0.001
	(0.002)
Δ FFR × 2000s	-0.005***
	(0.001)
Δ FFR × 2010s+	-0.027**
	(0.012)
Constant	0.002
	(0.001)
Observations	199
R2	0.17

3.I Results: Deposit Outflows – Cross Section in 2022

Outflows most pronounced for digital-brokers

Figure 1



3.I Results: Deposit Outflows – Cross Section 2010-2022

$$\frac{\text{Dep}_{b,t} - \text{Dep}_{b,t-1}}{\text{Dep}_{b,t-1}} = \alpha_b + \beta_1 \ \Delta FFR_{t,t-1} + \beta_2 \ \Delta FFR_{t,t-1} \times \text{Digital}_{b,t}$$
$$+ \beta_3 \ \Delta FFR_{t,t-1} \times \text{Broker}_{b,t} + \beta_4 \ \Delta FFR_{t,t-1} \times \text{Digital}_{b,t} \times \text{Broker}_{b,t} + \varepsilon_t$$

	(1) All	(2) Insured
Δ FFR	-0.016***	-0.014***
	(0.001)	(0.001)
Δ FFR × Digital	-0.006***	-0.003***
	(0.001)	(0.001)
Δ FFR × Broker	-0.007**	0.005
	(0.003)	(0.004)
Δ FFR × Digital × Broker	0.002	-0.003
	(0.004)	(0.005)
Bank FE	Yes	Yes
Observations	75,889	75,954
R2	0.23	0.20

3.I Results: Deposit Outflows – Within Bank

$$\frac{\text{Dep}_{b,c,t} - \text{Dep}_{b,c,t-1}}{\text{Dep}_{b,t-1}} = \alpha_{bt} + \alpha_{ct} + \beta_1 \ \Delta FFR_{t,t-1} \times \text{Internet}_c \times \text{Digital}_{b,t}$$

$$+ \beta_2 \ \Delta FFR_{t,t-1} \times \text{Internet}_c \times \text{Broker}_{b,t} + \beta_3 \ \Delta FFR_{t,t-1} \times \text{Internet}_c \times \text{Digital}_{b,t} \times \text{Broker}_{b,t} + \varepsilon_t$$

	(1)	(2)
Δ FFR $\times$ HH Internet Prop $\times$ Digital	-0.182***	-0.262***
	(0.064)	(0.067)
Δ FFR $\times$ HH Internet Prop $\times$ Broker		-0.103
		(0.173)
Δ FFR $\times$ HH Internet Prop $\times$ Digital $\times$ Broker		0.223
		(0.180)
Bank-Year FE	Yes	Yes
County-Year FE	Yes	Yes
Observations	284,194	284,194
R2	0.35	0.35

3.II Results: Deposit Betas

- Drechsler, Savov, Schnabl 2021 estimate:

$$\Delta IntExp_{bt} = \alpha_b + \sum_{\tau=0}^{3} \beta_{b,\tau}^{\text{Exp}} \Delta FFR_{t-\tau} + \varepsilon_{bt}$$

- Definition of deposit beta:

$$\text{Deposit beta} = \sum_{\tau=0}^{3} \beta_{b,\tau}^{\text{Exp}}$$

3.II Results: Deposit Betas

$$\Delta IntExp_{bt} = \alpha_b + \sum_{\tau=0}^{3} \beta_\tau^{\text{Exp}} \Delta FFR_{t-\tau} + \sum_{\tau=0}^{3} \beta_\tau^{\text{Type Exp}} \Delta FFR_{t-\tau} \times \text{Bank Type}_{b,t} + \varepsilon_{bt}$$

	Beta (Level Change in Int Exp/Assets)			
	(1)	(2)	(3)	(4)
	1983-2017	2010-2017	Digital 2010-2017	Digital Broker 2010-2017
$\sum_{\tau=0}^{3} \beta_\tau^{\text{Exp}}$	0.363	0.352	0.343	0.348
$\sum_{\tau=0}^{3} \beta_\tau^{\text{Exp}} + \sum_{\tau=0}^{3} \beta_\tau^{\text{Type Exp}}$			0.397	0.402
Observations	1,227,529	203,500	203,500	203,500
R2	0.25	0.10	0.10	0.10

3.II Results: Deposit Betas – Within Bank Rate Changes

$$\frac{\text{Rate}_{b,c,t} - \text{Rate}_{b,c,t-1}}{\text{Rate}_{b,t-1}} = \alpha_{bt} + \alpha_{ct} + \beta_1 \ \Delta FFR_{t,t-1} \times \text{Internet}_c \times \text{Digital}_{b,t}$$

$$+ \beta_2 \ \Delta FFR_{t,t-1} \times \text{Internet}_c \times \text{Broker}_{b,t} + \beta_3 \ \Delta FFR_{t,t-1} \times \text{Internet}_c \times \text{Digital}_{b,t} \times \text{Broker}_{b,t} + \varepsilon_t$$

	(1)	(2)
Δ FFR × HH Internet Prop × Digital	0.538**	0.571*
	(0.240)	(0.301)
Δ FFR × HH Internet Prop × Broker		0.324
		(0.464)
Δ FFR × HH Internet Prop × Digital × Broker		-0.196
		(0.472)
Bank-Year FE	Yes	Yes
County-Year FE	Yes	Yes
Observations	13,982	13,982
R2	0.86	0.86

3.III Results: Deposit Franchise Value

Drechsler, Savov, Schnabl, and Wang (2023) build on their previous influential work to suggest a simple expression for the value of the deposit franchise, which they denote by DF:

$$DF(f) = D(1 - w(s, f)) \left(1 - \beta - \frac{c}{f}\right)$$

- f Fed funds rate
- D level of deposits
- c capitalized costs of servicing a dollar of deposits
- β deposit beta
- $w(s, f)$ outflow rate

To bring to data, need estimates of deposit betas β and deposit outflows $w(s, f)$

3.III Results: Deposit Franchise Value

$$DF(f) = D(1 - w(s, f)) \left(1 - \beta - \frac{c}{f}\right)$$

- β deposit beta differs for each type of bank:
  - Traditional banks $= 0.345$
  - Digital-broker banks $= 0.402$
- $w(s, f)$ outflow rate: Linear approximation for $f_1 - f_0 = .04$ at the end of 2022, and where we assume $f_0 = 0$ and $w(0) = 0$

$$w(f_1) \approx w'(f_0) \times (f_1 - f_0)$$

  $w'(f_0)$ differs for each type of bank:
  - Traditional banks $= 1.6\%$
  - Digital-broker banks $= 2.9\%$
- $c = 0.02$ (DSSW 2023)

$\implies$ Deposit franchise value is 40% lower for digital-broker banks relative to if the bank had the same quantity of deposits but was a traditional bank.

3.III Results: SVB Case Study

Calculate deposit franchise value and observe marked-to-market losses (Jiang et al. 2023)

- If SVB were evaluated as if it were a traditional bank, remains solvent in early 2023: its equity and deposit franchise value less its marked-to-market losses remains positive ≈$3B
- Once we recognize that SVB is a digital-broker bank, becomes insolvent: its equity and deposit franchise value less its marked-to-market losses becomes negative ≈ -$5B

In a world of digital banking, monetary policy has a stronger impact on financial stability on account of the lower value of banks' deposit franchise

3.III Results: Deposit Franchise Value – Evidence from Stock Market Reaction

- Calculate predicted return for each bank stock on days -20 to -5 leading up to the 2022 rate hike days: $\text{Predicted Return}_i = \alpha_i + \beta_i \times \text{SP500 Return} + \varepsilon_i$
- Calculate abnormal return on day of rate hike: $\text{Return}_{it} - \text{Predicted Return}_i$
- Regress on rate hike days: $\text{Abnormal Return}_{it} = \beta_0 + \beta_1 \times \text{Digital}_i + \varepsilon_i$

	(1)	(2)
Digital	-0.003*	-0.003*
	(0.002)	(0.002)
Security Losses		0.006
		(0.023)
Constant	-0.003**	-0.003*
	(0.001)	(0.002)
Observations	709	709
R2	0.01	0.01

Summary

For digital banks,

1. Deposit outflows are larger as the Fed funds rate f increases
2. Deposit betas are higher the sensitivity of deposit rates to increases in f
3. Deposit franchise value is 40% lower relative to that of a non-digital bank
   - SVB insolvent in early 2023 given adjusted deposit franchise value calculation