Tracing Bank Runs in Real Time

Marco Cipriani
New York Fed

Thomas Eisenbach
New York Fed

Anna Kovner
Richmond Fed

Old time bank runs

Modern bank runs

- Running depositors wire their money to another bank
- We study March 2023 bank runs using real-time wire transfer data
  - Full cross-section of banks incl. non-public & run banks that did not fail
  - Hypothetical observation:

Date	Time	Sender	Receiver	Amount
12/25/2022	9:32:12	Bank A	Bank X	$5,670,000.00

→ Can answer:

- Which banks where run and why?
- How were they run?
- How did they respond?

Modern bank runs

- Running depositors wire their money to another bank
- We study March 2023 bank runs using real-time wire transfer data
  - Full cross-section of banks incl. non-public & run banks that did not fail
  - Hypothetical observation:

Date	Time	Sender	Receiver	Amount
12/25/2022	9:32:12	Bank A	Bank X	$5,670,000.00

→ Can answer:

- Which banks where run and why?
- How were they run?
- How did they respond?

Modern bank runs

- Running depositors wire their money to another bank
- We study March 2023 bank runs using real-time wire transfer data
  - Full cross-section of banks incl. non-public & run banks that did not fail
  - Hypothetical observation:

Date	Time	Sender	Receiver	Amount
12/25/2022	9:32:12	Bank A	Bank X	$5,670,000.00

➔ Can answer:

- Which banks where run and why?
- How were they run?
- How did they respond?

Recap: One week in March 2023 (from public sources)

Wed, Mar 8: Silicon Valley Bank (SVB) announces sale of AFS securities at a loss and plan to raise capital

Thu, Mar 9: SVB suffers run; loses ∼25% of deposits

Fri, Mar 10:

- SVB failure announced
- Signature Bank suffers run; loses ∼20% of deposits

Sun, Mar 12:

- Signature Bank failure announced
- Fed-Treasury-FDIC guarantee all deposits in SVB and Signature ("systemic risk exception"); Fed announces Bank Term Funding Program (BTFP)

Mon, Mar 13: Regional bank stocks drop 8% (largest daily drop in the period)

Wed, Mar 15: Banks borrowing $153b from discount window and $12b from BTFP

Recap: One week in March 2023 (from public sources)

Wed, Mar 8: Silicon Valley Bank (SVB) announces sale of AFS securities at a loss and plan to raise capital

Thu, Mar 9: SVB suffers run; loses ∼25% of deposits

Fri, Mar 10:

- SVB failure announced
- Signature Bank suffers run; loses ∼20% of deposits

Sun, Mar 12:

- Signature Bank failure announced
- Fed-Treasury-FDIC guarantee all deposits in SVB and Signature ("systemic risk exception"); Fed announces Bank Term Funding Program (BTFP)

Mon, Mar 13: Regional bank stocks drop 8% (largest daily drop in the period)

Wed, Mar 15: Banks borrowing $153b from discount window and $12b from BTFP

Recap: One week in March 2023 (from public sources)

Wed, Mar 8: Silicon Valley Bank (SVB) announces sale of AFS securities at a loss and plan to raise capital

Thu, Mar 9: SVB suffers run; loses ∼25% of deposits

Fri, Mar 10:

- SVB failure announced
- Signature Bank suffers run; loses ∼20% of deposits

Sun, Mar 12:

- Signature Bank failure announced
- Fed-Treasury-FDIC guarantee all deposits in SVB and Signature ("systemic risk exception"); Fed announces Bank Term Funding Program (BTFP)

Mon, Mar 13: Regional bank stocks drop 8% (largest daily drop in the period)

Wed, Mar 15: Banks borrowing $153b from discount window and $12b from BTFP

Recap: One week in March 2023 (from public sources)

Wed, Mar 8: Silicon Valley Bank (SVB) announces sale of AFS securities at a loss and plan to raise capital

Thu, Mar 9: SVB suffers run; loses ∼25% of deposits

Fri, Mar 10:

- SVB failure announced
- Signature Bank suffers run; loses ∼20% of deposits

Sun, Mar 12:

- Signature Bank failure announced
- Fed-Treasury-FDIC guarantee all deposits in SVB and Signature ("systemic risk exception"); Fed announces Bank Term Funding Program (BTFP)

Mon, Mar 13: Regional bank stocks drop 8% (largest daily drop in the period)

Wed, Mar 15: Banks borrowing $153b from discount window and $12b from BTFP

Recap: One week in March 2023 (from public sources)

Wed, Mar 8: Silicon Valley Bank (SVB) announces sale of AFS securities at a loss and plan to raise capital

Thu, Mar 9: SVB suffers run; loses ∼25% of deposits

Fri, Mar 10:

- SVB failure announced
- Signature Bank suffers run; loses ∼20% of deposits

Sun, Mar 12:

- Signature Bank failure announced
- Fed-Treasury-FDIC guarantee all deposits in SVB and Signature ("systemic risk exception"); Fed announces Bank Term Funding Program (BTFP)

Mon, Mar 13: Regional bank stocks drop 8% (largest daily drop in the period)

Wed, Mar 15: Banks borrowing $153b from discount window and $12b from BTFP

Recap: One week in March 2023 (from public sources)

Wed, Mar 8: Silicon Valley Bank (SVB) announces sale of AFS securities at a loss and plan to raise capital

Thu, Mar 9: SVB suffers run; loses ∼25% of deposits

Fri, Mar 10:

- SVB failure announced
- Signature Bank suffers run; loses ∼20% of deposits

Sun, Mar 12:

- Signature Bank failure announced
- Fed-Treasury-FDIC guarantee all deposits in SVB and Signature ("systemic risk exception"); Fed announces Bank Term Funding Program (BTFP)

Mon, Mar 13: Regional bank stocks drop 8% (largest daily drop in the period)

Wed, Mar 15: Banks borrowing $153b from discount window and $12b from BTFP

Runs were fast and concentrated

- Runs concentrated in only three days
  - Thursday, March 9 (SVB run) through Monday, March 13
  - Mainly Friday and Monday
- Identify 22 banks that were run (incl. 5 runs on Friday & 19 runs on Monday)
  - Over 10x more than failed → many survived
- Note: Monday is after announcement of SVB & Signature deposit guarantee!

Runs were fast and concentrated

- Runs concentrated in only three days
  - Thursday, March 9 (SVB run) through Monday, March 13
  - Mainly Friday and Monday
- Identify 22 banks that were run (incl. 5 runs on Friday & 19 runs on Monday)
  - Over 10x more than failed → many survived
- Note: Monday is after announcement of SVB & Signature deposit guarantee!

Runs were fast and concentrated

- Runs concentrated in only three days
  - Thursday, March 9 (SVB run) through Monday, March 13
  - Mainly Friday and Monday
- Identify 22 banks that were run (incl. 5 runs on Friday & 19 runs on Monday)
  - Over 10x more than failed → many survived
- Note: Monday is after announcement of SVB & Signature deposit guarantee!

Anatomy of the runs

- Runs driven by large (uninsured) depositors
  - "Few large" rather than "many small" withdrawals ➔ not a retail phenomenon
- Network of flows
  - Flight-to-safety of fastest depositors to largest banks

Anatomy of the runs

- Runs driven by large (uninsured) depositors
  - "Few large" rather than "many small" withdrawals ➔ not a retail phenomenon
- Network of flows
  - Flight-to-safety of fastest depositors to largest banks

Fundamentals vs. panic

- Characteristics of run banks
  1. Lower solvency and liquidity
  2. Higher & more concentrated uninsured deposits
  3. Predominantly publicly traded

- For public banks
  - Significant relation b/w stock returns and deposit outflows on run days
  - But: R^2 only 40% ... 30 banks had return $< -20\%$, only 9 had run

Fundamentals vs. panic

- Characteristics of run banks
  1. Lower solvency and liquidity
  2. Higher & more concentrated uninsured deposits
  3. Predominantly publicly traded

- For public banks
  - Significant relation b/w stock returns and deposit outflows on run days
  - But: R^2 only 40% ... 30 banks had return $< -20\%$, only 9 had run

How do (surviving) run banks respond?

Short term

- Substitute lost deposits with new borrowing
- Pecking order of emergency borrowing:
  1. From FHLBs → lender of next-to-last resort
  2. From discount window → lender of last resort
- No sales of securities (or other assets)

Long term

- Substitute with insured deposits and pay higher interest rates overall

How do (surviving) run banks respond?

Short term

- Substitute lost deposits with new borrowing
- Pecking order of emergency borrowing:
  1. From FHLBs → lender of next-to-last resort
  2. From discount window → lender of last resort
- No sales of securities (or other assets)

Long term

- Substitute with insured deposits and pay higher interest rates overall

How do (surviving) run banks respond?

Short term

- Substitute lost deposits with new borrowing
- Pecking order of emergency borrowing:
  1. From FHLBs ➔ lender of next-to-last resort
  2. From discount window ➔ lender of last resort
- No sales of securities (or other assets)

Long term

- Substitute with insured deposits and pay higher interest rates overall

How do (surviving) run banks respond?

Short term

- Substitute lost deposits with new borrowing
- Pecking order of emergency borrowing:
  1. From FHLBs → lender of next-to-last resort
  2. From discount window → lender of last resort
- No sales of securities (or other assets)

Long term

- Substitute with insured deposits and pay higher interest rates overall

Identifying runs in payments data

Identifying runs in payments data

- Payments are volatile, especially for banks sending few payments

➔ z-score of net payments received

$$z_{it} = \frac{n_{it} - \mu_i}{\sigma_i}$$

- with μ_i and σ_i calculated Mar2022–Feb2023

Identifying runs in payments data

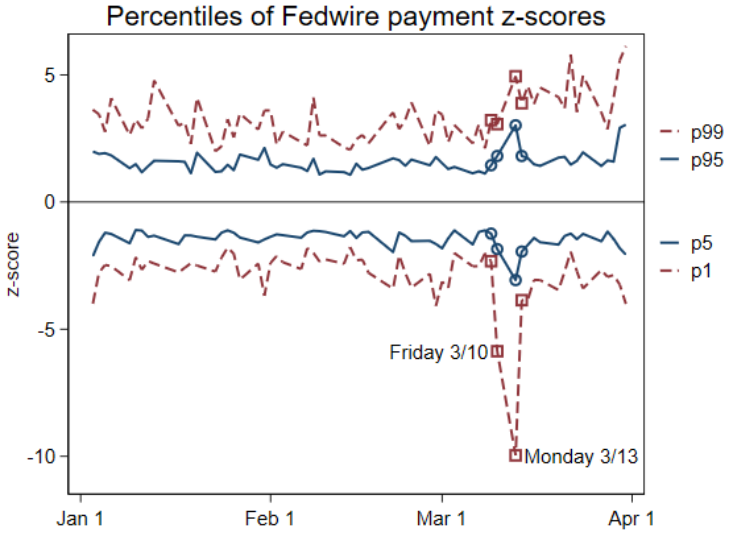
- Payments are volatile, especially for banks sending few payments

➔ z-score of net payments received

$$z_{it} = \frac{n_{it} - \mu_i}{\sigma_i}$$

  - with μ_i and σ_i calculated Mar2022–Feb2023

Runs observable in the raw data



- Sample of over 600 banks
- "Systemic" runs for only two days (Fri & Mon)
- Worse on Monday, after Sunday guarantee announcement

Identifying banks that were run

- Classify "run bank" as z-score below -5
  - Less than 0.2% of bank-days in 12 months pre-March 2023

→ Identify 22 unique run banks
  - 5 banks run on Friday, March 10
  - 19 banks run on Monday, March 13

Identifying banks that were run

- Classify "run bank" as z-score below -5
  - Less than 0.2% of bank-days in 12 months pre-March 2023

➔ Identify 22 unique run banks
  - 5 banks run on Friday, March 10
  - 19 banks run on Monday, March 13

Anatomy of the runs

Empirical approach

- Focus on main run days Friday, March 10 and Monday, March 13
- Panel regressions on daily payments data (January 1 to March 14)

$$
\begin{aligned}
y_{it} = \phi_i + \varphi_t + \varepsilon_{it} \\
&+ \beta_{\text{Mar10}} \times \mathbb{I}[\text{date } t = \text{Mar10}] \times \mathbb{I}[\text{bank } i \text{ is run on Mar10}] \\
&+ \beta_{\text{Mar13}} \times \mathbb{I}[\text{date } t = \text{Mar13}] \times \mathbb{I}[\text{bank } i \text{ is run on Mar13}]
\end{aligned}
$$

→ Unusual wire activity of the average run bank on the respective run day

- Accounting for
  - Fixed differences across banks (bank fixed effects ϕ_i)
  - Common variation over time (date fixed effects φ_t)

Empirical approach

- Focus on main run days Friday, March 10 and Monday, March 13
- Panel regressions on daily payments data (January 1 to March 14)

$$
\begin{aligned}
y_{it} = \phi_i + \varphi_t + \varepsilon_{it} \\
+ \beta_{\text{Mar10}} \times \mathbb{I}[\text{date } t = \text{Mar10}] \times \mathbb{I}[\text{bank } i \text{ is run on Mar10}] \\
+ \beta_{\text{Mar13}} \times \mathbb{I}[\text{date } t = \text{Mar13}] \times \mathbb{I}[\text{bank } i \text{ is run on Mar13}]
\end{aligned}
$$

➔ Unusual wire activity of the average run bank on the respective run day

- Accounting for
  - Fixed differences across banks (bank fixed effects ϕ_i)
  - Common variation over time (date fixed effects φ_t)

Scale of payments activity on run days

	Log paym. value		Log paym. volume		Log avg. paym. size	
	Sent	Rcvd.	Sent	Rcvd.	Sent	Rcvd.
	(1)	(2)	(3)	(4)	(5)	(6)
$Mar10_t \times RunMar10_i$	1.540***	-0.006	0.229**	-0.064	1.311***	0.057
	(0.152)	(0.063)	(0.103)	(0.048)	(0.193)	(0.087)
$Mar13_t \times RunMar13_i$	1.316***	-0.228**	0.181**	-0.043*	1.135***	-0.185**
	(0.141)	(0.098)	(0.076)	(0.024)	(0.137)	(0.092)
Date & bank FEs	Y	Y	Y	Y	Y	Y
Observations	31,144	31,145	31,144	31,145	31,144	31,145
Adjusted R^2	0.937	0.934	0.979	0.986	0.774	0.771

- Payments sent
  - Value sent more than triples
  - Volume sent increases "only" 20%
  - → Not a flood of small depositors!
- Payments received
  - Some decline on Monday
  - → Hesitance to send to run banks?

Scale of payments activity on run days

	Log paym. value		Log paym. volume		Log avg. paym. size	
	Sent (1)	Rcvd. (2)	Sent (3)	Rcvd. (4)	Sent (5)	Rcvd. (6)
$Mar10_t \times RunMar10_i$	1.540***	-0.006	0.229**	-0.064	1.311***	0.057
	(0.152)	(0.063)	(0.103)	(0.048)	(0.193)	(0.087)
$Mar13_t \times RunMar13_i$	1.316***	-0.228**	0.181**	-0.043*	1.135***	-0.185**
	(0.141)	(0.098)	(0.076)	(0.024)	(0.137)	(0.092)
Date & bank FEs	Y	Y	Y	Y	Y	Y
Observations	31,144	31,145	31,144	31,145	31,144	31,145
Adjusted R^2	0.937	0.934	0.979	0.986	0.774	0.771

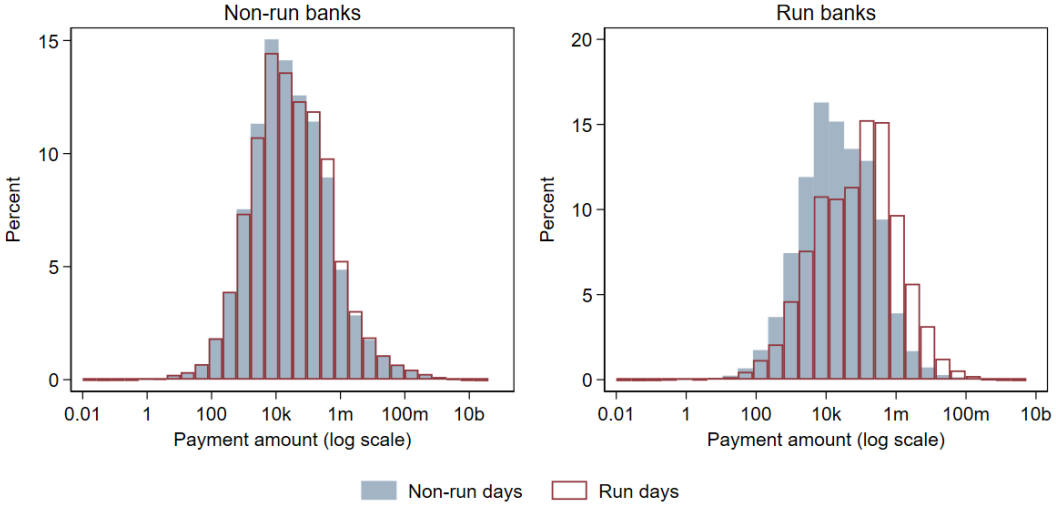
- Payments sent
  - Value sent more than triples
  - Volume sent increases "only" 20%
  - → Not a flood of small depositors!
- Payments received
  - Some decline on Monday
  - → Hesitance to send to run banks?

Scale of payments activity on run days

	Log paym. value		Log paym. volume		Log avg. paym. size	
	Sent (1)	Rcvd. (2)	Sent (3)	Rcvd. (4)	Sent (5)	Rcvd. (6)
$Mar10_t \times RunMar10_i$	1.540***	-0.006	0.229**	-0.064	1.311***	0.057
	(0.152)	(0.063)	(0.103)	(0.048)	(0.193)	(0.087)
$Mar13_t \times RunMar13_i$	1.316***	-0.228**	0.181**	-0.043*	1.135***	-0.185**
	(0.141)	(0.098)	(0.076)	(0.024)	(0.137)	(0.092)
Date & bank FEs	Y	Y	Y	Y	Y	Y
Observations	31,144	31,145	31,144	31,145	31,144	31,145
Adjusted R^2	0.937	0.934	0.979	0.986	0.774	0.771

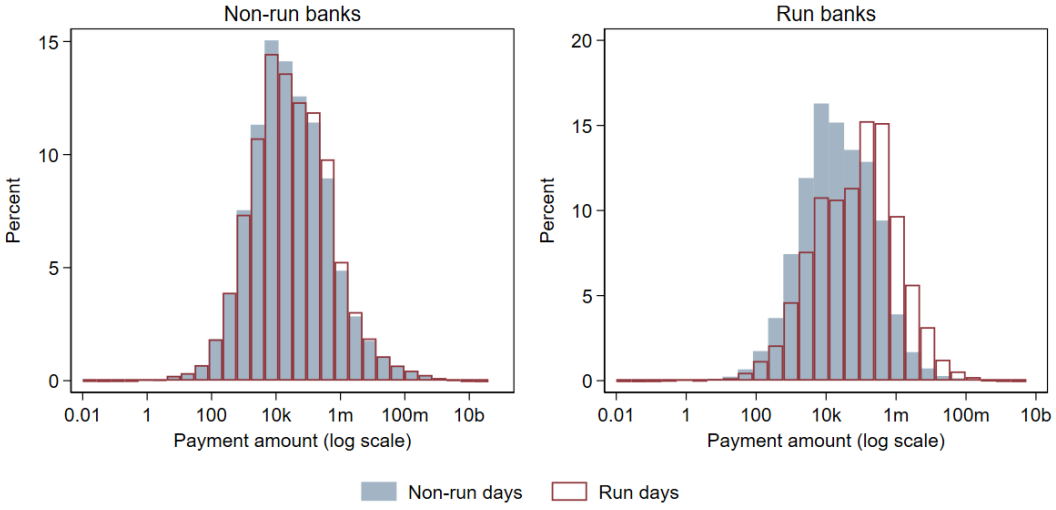
- Payments sent
  - Value sent more than triples
  - Volume sent increases "only" 20%
  - → Not a flood of small depositors!
- Payments received
  - Some decline on Monday
  - → Hesitance to send to run banks?

Distribution of individual payment amounts



- Each withdrawal at Signature: \$12m on avg. (\$19b / 1,600) —from public sources

Distribution of individual payment amounts



- Each withdrawal at Signature: $12m on avg. ($19b / 1,600) —from public sources

Where does the money go?

	Log payments value sent to		
	Largest (1)	Large (2)	Small (3)
$\text{Mar10}_t \times \text{RunMar10}_i$	2.031***	1.670***	0.633**
	(0.172)	(0.298)	(0.254)
$\text{Mar13}_t \times \text{RunMar13}_i$	0.975***	1.336***	0.810***
	(0.187)	(0.431)	(0.213)
Date & bank FEs	Y	Y	Y
Observations	31,156	31,156	31,156
Adjusted R^2	0.916	0.653	0.825

Largest: $\geq$\$250b; large: \$250b to \$100b; small: $<$\$100b

Friday: flight to the very largest banks (+660% vs. +430% vs. +90%)

Monday: somewhat more balanced

➔ Friday runners more sophisticated?

- Run faster and/or ...
- already have accounts at largest banks

Where does the money go?

	Log payments value sent to		
	Largest (1)	Large (2)	Small (3)
$\text{Mar10}_t \times \text{RunMar10}_i$	2.031***	1.670***	0.633**
	(0.172)	(0.298)	(0.254)
$\text{Mar13}_t \times \text{RunMar13}_i$	0.975***	1.336***	0.810***
	(0.187)	(0.431)	(0.213)
Date & bank FEs	Y	Y	Y
Observations	31,156	31,156	31,156
Adjusted R^2	0.916	0.653	0.825

Largest: $\geq$\$250b; large: \$250b to \$100b; small: $<$\$100b

Friday: flight to the very largest banks (+660% vs. +430% vs. +90%)

Monday: somewhat more balanced

→ Friday runners more sophisticated?

- Run faster and/or ...
- already have accounts at largest banks

Where does the money go?

	Log payments value sent to		
	Largest (1)	Large (2)	Small (3)
$\text{Mar10}_t \times \text{RunMar10}_i$	2.031***	1.670***	0.633**
	(0.172)	(0.298)	(0.254)
$\text{Mar13}_t \times \text{RunMar13}_i$	0.975***	1.336***	0.810***
	(0.187)	(0.431)	(0.213)
Date & bank FEs	Y	Y	Y
Observations	31,156	31,156	31,156
Adjusted R^2	0.916	0.653	0.825

Largest: $\geq$\$250b; large: \$250b to \$100b; small: $<$\$100b

Friday: flight to the very largest banks (+660% vs. +430% vs. +90%)

Monday: somewhat more balanced

→ Friday runners more sophisticated?

- Run faster and/or . . .
- already have accounts at largest banks

Where does the money go?

	Log payments value sent to		
	Largest (1)	Large (2)	Small (3)
$\text{Mar10}_t \times \text{RunMar10}_i$	2.031***	1.670***	0.633**
	(0.172)	(0.298)	(0.254)
$\text{Mar13}_t \times \text{RunMar13}_i$	0.975***	1.336***	0.810***
	(0.187)	(0.431)	(0.213)
Date & bank FEs	Y	Y	Y
Observations	31,156	31,156	31,156
Adjusted R^2	0.916	0.653	0.825

Largest: $\geq$\$250b; large: \$250b to \$100b; small: $<$\$100b

Friday: flight to the very largest banks (+660% vs. +430% vs. +90%)

Monday: somewhat more balanced

➔ Friday runners more sophisticated?

- Run faster and/or ...
- already have accounts at largest banks

Where is money (still) coming from?

	Log payments value rcvd. from		
	Largest	Large	Small
	(1)	(2)	(3)
$\text{Mar10}_t \times \text{RunMar10}_i$	0.001	-0.320	-0.049
	(0.152)	(0.209)	(0.121)
$\text{Mar13}_t \times \text{RunMar13}_i$	-0.312***	-0.050	-0.190
	(0.105)	(0.180)	(0.161)
Date & bank FEs	Y	Y	Y
Observations	31,156	31,156	31,156
Adjusted R^2	0.895	0.668	0.825

Largest: $\geq$\$250b; large: \$250b to \$100b; small: $<$\$100b

Friday: No change in incoming payments

Monday: Largest banks and only they reduce payments to run banks

→ Special role of the largest banks?

- Unique informational advantage as recipients of run banks' flows
- Hesitant to send payments to banks at risk of failure

Where is money (still) coming from?

	Log payments value rcvd. from		
	Largest (1)	Large (2)	Small (3)
$\text{Mar10}_t \times \text{RunMar10}_i$	0.001	-0.320	-0.049
	(0.152)	(0.209)	(0.121)
$\text{Mar13}_t \times \text{RunMar13}_i$	-0.312***	-0.050	-0.190
	(0.105)	(0.180)	(0.161)
Date & bank FEs	Y	Y	Y
Observations	31,156	31,156	31,156
Adjusted R^2	0.895	0.668	0.825

Largest: $\geq$\$250b; large: \$250b to \$100b; small: $<$\$100b

Friday: No change in incoming payments

Monday: Largest banks and only they reduce payments to run banks

→ Special role of the largest banks?

- Unique informational advantage as recipients of run banks' flows
- Hesitant to send payments to banks at risk of failure

Where is money (still) coming from?

	Log payments value rcvd. from		
	Largest (1)	Large (2)	Small (3)
$\text{Mar10}_t \times \text{RunMar10}_i$	0.001	-0.320	-0.049
	(0.152)	(0.209)	(0.121)
$\text{Mar13}_t \times \text{RunMar13}_i$	-0.312***	-0.050	-0.190
	(0.105)	(0.180)	(0.161)
Date & bank FEs	Y	Y	Y
Observations	31,156	31,156	31,156
Adjusted R^2	0.895	0.668	0.825

Largest: $\geq$\$250b; large: \$250b to \$100b; small: $<$\$100b

Friday: No change in incoming payments

Monday: Largest banks and only they reduce payments to run banks

➔ Special role of the largest banks?

- Unique informational advantage as recipients of run banks' flows
- Hesitant to send payments to banks at risk of failure

Characteristics of run banks

Fundamentals vs. panic

	Run banks	Non-run banks	Diff.	p-val.
Total assets ($b)	52.026	41.482	10.543	0.523
Assets over $250b	0.000	0.023	-0.023^{ooo}	0.000
Assets $250b to $100b	0.136	0.028	0.108	0.165
Assets under $100b	0.864	0.949	-0.085	0.273
Tier-1 cap./assets	0.089	0.100	-0.011^{oo}	0.001
Cash/assets	0.037	0.066	-0.029^{ooo}	0.000
Unins./total deposits	0.490	0.394	0.097**	0.034
Num. unins./tot. dep. ($m)	0.439	0.543	-0.104***	0.005
Corp./total deposits	0.504	0.412	0.091**	0.038
FHLB borr./assets	0.066	0.039	0.028*	0.050
Publicly traded	0.818	0.365	0.453^{ooo}	0.000
Observations	22	602	624	

Significance: * 0.1, ** 0.05, *** 0.01, ^{o} 0.005, ^{oo} 0.0025, ^{ooo} 0.0005

No sign. difference:

- Securities/assets
- Loans/assets
- CRE/total loans
- RRE/total loans
- Deposits/assets
- Recip. deposits/assets
- HTM loss/tier-1 cap.
- Deposit growth (yoy)
- Asset growth (yoy)

- Low solvency and liquidity
- High & concentrated uninsured deposits, wholesale funding
- More than twice as likely to be publicly traded

Fundamentals vs. panic

	Run banks	Non-run banks	Diff.	p-val.
Total assets ($b)	52.026	41.482	10.543	0.523
Assets over $250b	0.000	0.023	-0.023^{ooo}	0.000
Assets $250b to $100b	0.136	0.028	0.108	0.165
Assets under $100b	0.864	0.949	-0.085	0.273
Tier-1 cap./assets	0.089	0.100	-0.011^{oo}	0.001
Cash/assets	0.037	0.066	-0.029^{ooo}	0.000
Unins./total deposits	0.490	0.394	0.097**	0.034
Num. unins./tot. dep. ($m)	0.439	0.543	-0.104***	0.005
Corp./total deposits	0.504	0.412	0.091**	0.038
FHLB borr./assets	0.066	0.039	0.028*	0.050
Publicly traded	0.818	0.365	0.453^{ooo}	0.000
Observations	22	602	624	

Significance: * 0.1, ** 0.05, *** 0.01, ^{o} 0.005, ^{oo} 0.0025, ^{ooo} 0.0005

No sign. difference:

- Securities/assets
- Loans/assets
- CRE/total loans
- RRE/total loans
- Deposits/assets
- Recip. deposits/assets
- HTM loss/tier-1 cap.
- Deposit growth (yoy)
- Asset growth (yoy)

- Low solvency and liquidity
- High & concentrated uninsured deposits, wholesale funding
- More than twice as likely to be publicly traded

Fundamentals vs. panic

	Run banks	Non-run banks	Diff.	p-val.
Total assets ($b)	52.026	41.482	10.543	0.523
Assets over $250b	0.000	0.023	-0.023^{ooo}	0.000
Assets $250b to $100b	0.136	0.028	0.108	0.165
Assets under $100b	0.864	0.949	-0.085	0.273
Tier-1 cap./assets	0.089	0.100	-0.011^{oo}	0.001
Cash/assets	0.037	0.066	-0.029^{ooo}	0.000
Unins./total deposits	0.490	0.394	0.097**	0.034
Num. unins./tot. dep. ($m)	0.439	0.543	-0.104***	0.005
Corp./total deposits	0.504	0.412	0.091**	0.038
FHLB borr./assets	0.066	0.039	0.028*	0.050
Publicly traded	0.818	0.365	0.453^{ooo}	0.000
Observations	22	602	624	

Significance: * 0.1, ** 0.05, *** 0.01, ^{o} 0.005, ^{oo} 0.0025, ^{ooo} 0.0005

No sign. difference:

- Securities/assets
- Loans/assets
- CRE/total loans
- RRE/total loans
- Deposits/assets
- Recip. deposits/assets
- HTM loss/tier-1 cap.
- Deposit growth (yoy)
- Asset growth (yoy)

- Low solvency and liquidity
- High & concentrated uninsured deposits, wholesale funding
- More than twice as likely to be publicly traded

Fundamentals vs. panic

	Run banks	Non-run banks	Diff.	p-val.
Total assets ($b)	52.026	41.482	10.543	0.523
Assets over $250b	0.000	0.023	-0.023^{ooo}	0.000
Assets $250b to $100b	0.136	0.028	0.108	0.165
Assets under $100b	0.864	0.949	-0.085	0.273
Tier-1 cap./assets	0.089	0.100	-0.011^{oo}	0.001
Cash/assets	0.037	0.066	-0.029^{ooo}	0.000
Unins./total deposits	0.490	0.394	0.097**	0.034
Num. unins./tot. dep. ($m)	0.439	0.543	-0.104***	0.005
Corp./total deposits	0.504	0.412	0.091**	0.038
FHLB borr./assets	0.066	0.039	0.028*	0.050
Publicly traded	0.818	0.365	0.453^{ooo}	0.000
Observations	22	602	624	

Significance: * 0.1, ** 0.05, *** 0.01, ^{o} 0.005, ^{oo} 0.0025, ^{ooo} 0.0005

No sign. difference:

- Securities/assets
- Loans/assets
- CRE/total loans
- RRE/total loans
- Deposits/assets
- Recip. deposits/assets
- HTM loss/tier-1 cap.
- Deposit growth (yoy)
- Asset growth (yoy)

- Low solvency and liquidity
- High & concentrated uninsured deposits, wholesale funding
- More than twice as likely to be publicly traded

Predicting run banks

Cross-sectional regression $y_i = \alpha + \beta X_i + \varepsilon_i$

	Run bank dummy		Min z-score 3/9–3/14	
Assets \$250b to \$100b	0.164**	(0.066)	-3.938**	(1.834)
Assets under \$100b	0.097***	(0.034)	-1.212**	(0.576)
Cash/assets	-0.004	(0.005)	0.072	(0.089)
Loans/assets	0.009	(0.008)	-0.144	(0.126)
Deposits/assets	0.003	(0.008)	-0.168	(0.175)
FHLB borr./assets	0.016	(0.010)	-0.234	(0.144)
Tier-1 cap./assets	-0.007	(0.005)	0.047	(0.079)
Unins./total deposits	0.020**	(0.008)	-0.317**	(0.144)
Num. unins./tot. dep.	-0.017*	(0.009)	0.235*	(0.120)
Corp./total deposits	0.009	(0.007)	-0.175*	(0.093)
HTM loss/tier-1 cap.	0.007	(0.008)	-0.147	(0.123)
Unins. dep. × HTM loss	0.009	(0.008)	-0.183*	(0.105)
Publicly traded	0.052***	(0.017)	-0.632***	(0.197)
Observations	624		624	
Adjusted R^2	0.065		0.128	
Area under ROC curve	0.833		n/a	

- Significant predictors:
  - High & concentr. unins. dep.
  - Publicly traded — cf. uncond. effect of 6.6pp (1.0% vs. 7.6%)
- Only moderate predictive power

Predicting run banks

Cross-sectional regression $y_i = \alpha + \beta X_i + \varepsilon_i$

	Run bank dummy		Min z-score 3/9–3/14	
Assets \$250b to \$100b	0.164**	(0.066)	-3.938**	(1.834)
Assets under \$100b	0.097***	(0.034)	-1.212**	(0.576)
Cash/assets	-0.004	(0.005)	0.072	(0.089)
Loans/assets	0.009	(0.008)	-0.144	(0.126)
Deposits/assets	0.003	(0.008)	-0.168	(0.175)
FHLB borr./assets	0.016	(0.010)	-0.234	(0.144)
Tier-1 cap./assets	-0.007	(0.005)	0.047	(0.079)
Unins./total deposits	0.020**	(0.008)	-0.317**	(0.144)
Num. unins./tot. dep.	-0.017*	(0.009)	0.235*	(0.120)
Corp./total deposits	0.009	(0.007)	-0.175*	(0.093)
HTM loss/tier-1 cap.	0.007	(0.008)	-0.147	(0.123)
Unins. dep. × HTM loss	0.009	(0.008)	-0.183*	(0.105)
Publicly traded	0.052***	(0.017)	-0.632***	(0.197)
Observations	624		624	
Adjusted R^2	0.065		0.128	
Area under ROC curve	0.833		n/a	

- Significant predictors:
  - High & concentr. unins. dep.
  - Publicly traded — cf. uncond. effect of 6.6pp (1.0% vs. 7.6%)
- Only moderate predictive power

Predicting run banks

Cross-sectional regression $y_i = \alpha + \beta X_i + \varepsilon_i$

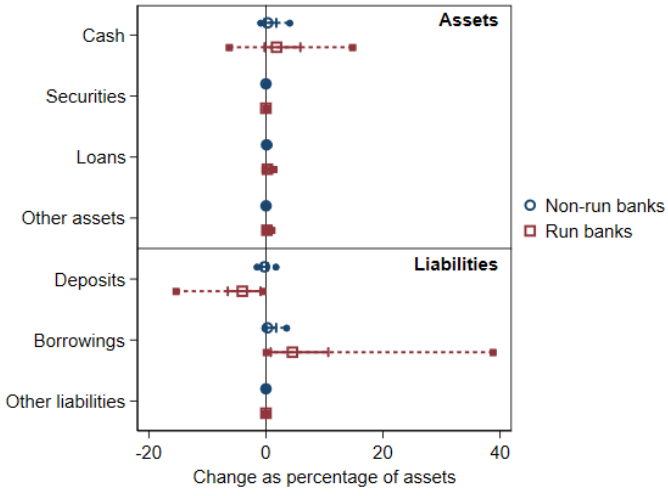
	Run bank dummy		Min z-score 3/9–3/14	
Assets \$250b to \$100b	0.164**	(0.066)	-3.938**	(1.834)
Assets under \$100b	0.097***	(0.034)	-1.212**	(0.576)
Cash/assets	-0.004	(0.005)	0.072	(0.089)
Loans/assets	0.009	(0.008)	-0.144	(0.126)
Deposits/assets	0.003	(0.008)	-0.168	(0.175)
FHLB borr./assets	0.016	(0.010)	-0.234	(0.144)
Tier-1 cap./assets	-0.007	(0.005)	0.047	(0.079)
Unins./total deposits	0.020**	(0.008)	-0.317**	(0.144)
Num. unins./tot. dep.	-0.017*	(0.009)	0.235*	(0.120)
Corp./total deposits	0.009	(0.007)	-0.175*	(0.093)
HTM loss/tier-1 cap.	0.007	(0.008)	-0.147	(0.123)
Unins. dep. × HTM loss	0.009	(0.008)	-0.183*	(0.105)
Publicly traded	0.052***	(0.017)	-0.632***	(0.197)
Observations	624		624	
Adjusted R^2	0.065		0.128	
Area under ROC curve	0.833		n/a	

- Significant predictors:
  - High & concentr. unins. dep.
  - Publicly traded — cf. uncond. effect of 6.6pp (1.0% vs. 7.6%)
- Only moderate predictive power

Responses of (surviving) run banks

Balance sheet changes (Wednesday to Wednesday)

Weekly FR 2644 data includes about half of our sample (308 banks)

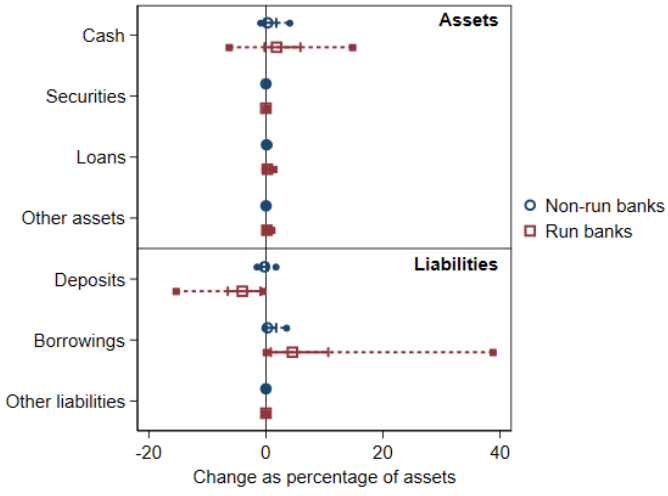


- Liabilities
  - Expected decrease in deposits
  - Larger increase in other borrowings, esp. in tails
- Assets
  - 75% of run banks increase cash holdings
  - No sales of securities (or other assets)

→ More than substitute with other borrowings

Balance sheet changes (Wednesday to Wednesday)

Weekly FR 2644 data includes about half of our sample (308 banks)

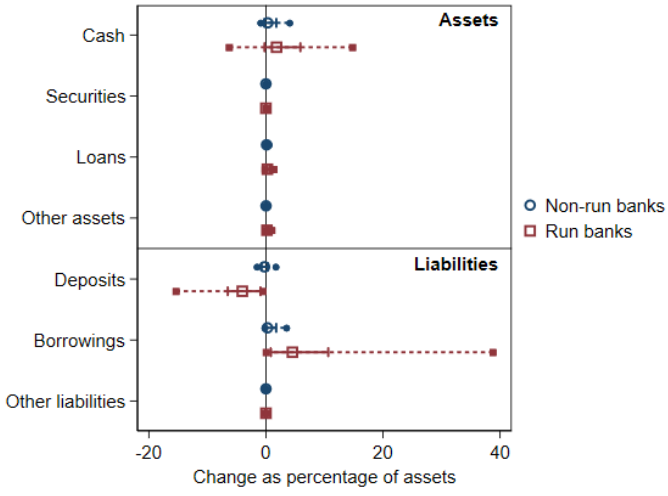


- Liabilities
  - Expected decrease in deposits
  - Larger increase in other borrowings, esp. in tails
- Assets
  - 75% of run banks increase cash holdings
  - No sales of securities (or other assets)

→ More than substitute with other borrowings

Balance sheet changes (Wednesday to Wednesday)

Weekly FR 2644 data includes about half of our sample (308 banks)

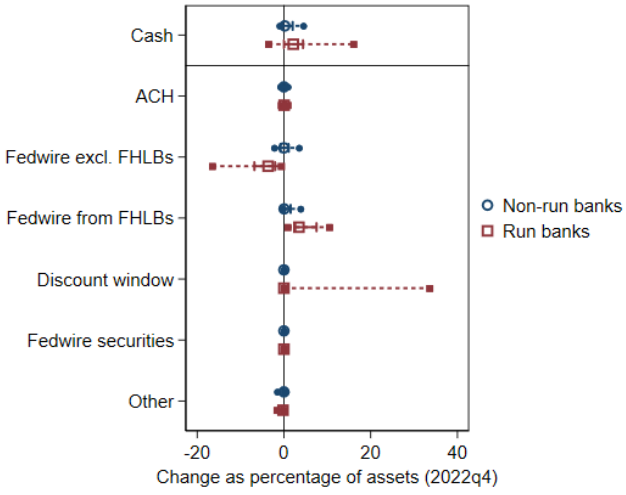


- Liabilities
  - Expected decrease in deposits
  - Larger increase in other borrowings, esp. in tails
- Assets
  - 75% of run banks increase cash holdings
  - No sales of securities (or other assets)

→ More than substitute with other borrowings

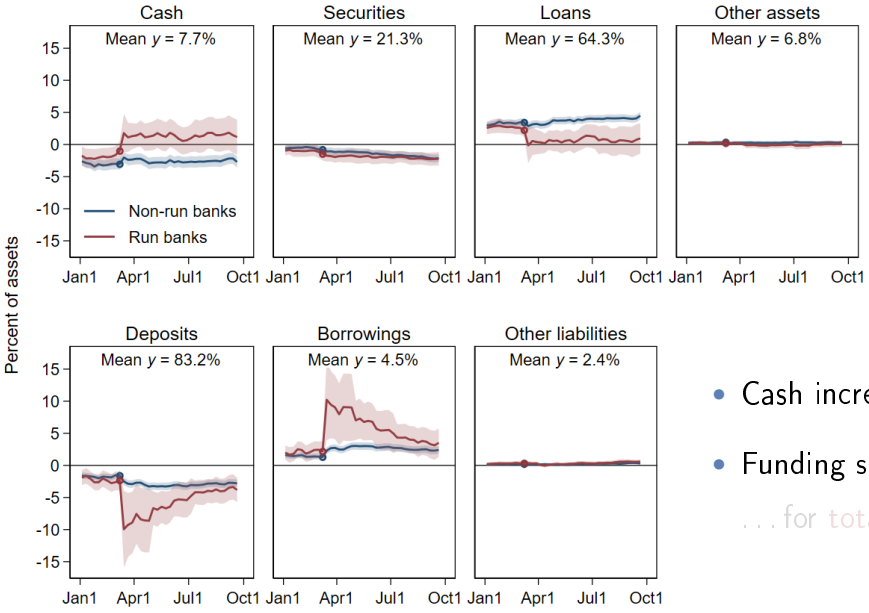
Fed account balance changes by source (Wed to Wed)

Account balances data includes all of our sample



- Pecking order of emergency borrowing:
  - Almost all run banks borrow from FHLBs
  - Only few run banks borrow from DW . . . but heavily so
  - → FHLBs are "lender of next-to-last resort"

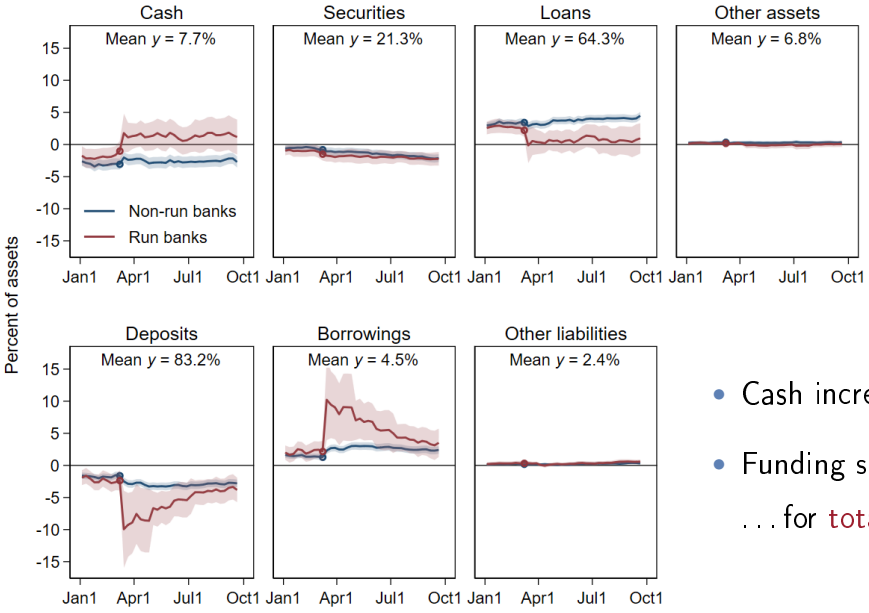
Balance sheets in the long term



- Cash increase is persistent
- Funding substitution reverts

  . . . for total deposits

Balance sheets in the long term



- Cash increase is persistent
- Funding substitution reverts

  . . . for total deposits

Funding substitution in the long term

Quarterly call report date includes all of our sample

	All liabilities			Deposits detail		Interest rate on	
	Deposits (1)	FHLB borr. (2)	Oth. liab. (3)	Insured (4)	Unins. (5)	Deposits (6)	FHLB borr. (7)
$2023q1_t \times RunBank_i$	-4.843**	2.674***	2.145	5.149**	-9.988***	0.357***	0.796**
	(1.985)	(0.978)	(1.681)	(2.068)	(2.675)	(0.097)	(0.338)
$2023q2_t \times RunBank_i$	-0.704	0.134	0.547	6.506***	-7.205***	0.426***	1.605***
	(0.997)	(0.832)	(0.921)	(2.280)	(2.764)	(0.099)	(0.358)
$2023q3_t \times RunBank_i$	-0.288	-0.927	1.199	7.182***	-7.466***	0.502***	1.749***
	(1.029)	(0.757)	(1.004)	(2.388)	(2.736)	(0.114)	(0.411)
Date & bank FEs	Y	Y	Y	Y	Y	Y	Y
Mean depend. var.	81.32	3.39	15.34	49.91	31.54	0.76	2.03
Observations	4,409	4,346	4,409	4,402	4,402	4,330	3,674
Adjusted R^2	0.925	0.787	0.944	0.885	0.874	0.799	0.156

- Persistent loss of uninsured deposits
- Substituted with insured deposits at higher rates (some are reciprocal deposits)

Funding substitution in the long term

Quarterly call report date includes all of our sample

	All liabilities			Deposits detail		Interest rate on	
	Deposits (1)	FHLB borr. (2)	Oth. liab. (3)	Insured (4)	Unins. (5)	Deposits (6)	FHLB borr. (7)
$2023q1_t \times RunBank_i$	-4.843**	2.674***	2.145	5.149**	-9.988***	0.357***	0.796**
	(1.985)	(0.978)	(1.681)	(2.068)	(2.675)	(0.097)	(0.338)
$2023q2_t \times RunBank_i$	-0.704	0.134	0.547	6.506***	-7.205***	0.426***	1.605***
	(0.997)	(0.832)	(0.921)	(2.280)	(2.764)	(0.099)	(0.358)
$2023q3_t \times RunBank_i$	-0.288	-0.927	1.199	7.182***	-7.466***	0.502***	1.749***
	(1.029)	(0.757)	(1.004)	(2.388)	(2.736)	(0.114)	(0.411)
Date & bank FEs	Y	Y	Y	Y	Y	Y	Y
Mean depend. var.	81.32	3.39	15.34	49.91	31.54	0.76	2.03
Observations	4,409	4,346	4,409	4,402	4,402	4,330	3,674
Adjusted R^2	0.925	0.787	0.944	0.885	0.874	0.799	0.156

- Persistent loss of uninsured deposits
- Substituted with insured deposits at higher rates (some are reciprocal deposits)

Funding substitution in the long term

Quarterly call report date includes all of our sample

	All liabilities			Deposits detail		Interest rate on	
	Deposits (1)	FHLB borr. (2)	Oth. liab. (3)	Insured (4)	Unins. (5)	Deposits (6)	FHLB borr. (7)
$2023q1_t \times RunBank_i$	-4.843**	2.674***	2.145	5.149**	-9.988***	0.357***	0.796**
	(1.985)	(0.978)	(1.681)	(2.068)	(2.675)	(0.097)	(0.338)
$2023q2_t \times RunBank_i$	-0.704	0.134	0.547	6.506***	-7.205***	0.426***	1.605***
	(0.997)	(0.832)	(0.921)	(2.280)	(2.764)	(0.099)	(0.358)
$2023q3_t \times RunBank_i$	-0.288	-0.927	1.199	7.182***	-7.466***	0.502***	1.749***
	(1.029)	(0.757)	(1.004)	(2.388)	(2.736)	(0.114)	(0.411)
Date & bank FEs	Y	Y	Y	Y	Y	Y	Y
Mean depend. var.	81.32	3.39	15.34	49.91	31.54	0.76	2.03
Observations	4,409	4,346	4,409	4,402	4,402	4,330	3,674
Adjusted R^2	0.925	0.787	0.944	0.885	0.874	0.799	0.156

- Persistent loss of uninsured deposits
- Substituted with insured deposits at higher rates (some are reciprocal deposits)

Thank you!