

# WHOLESALE FUNDING CRISES SINCE 1800

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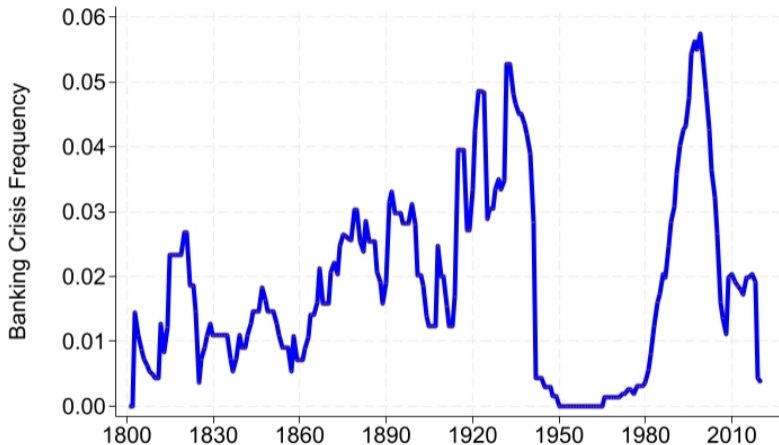
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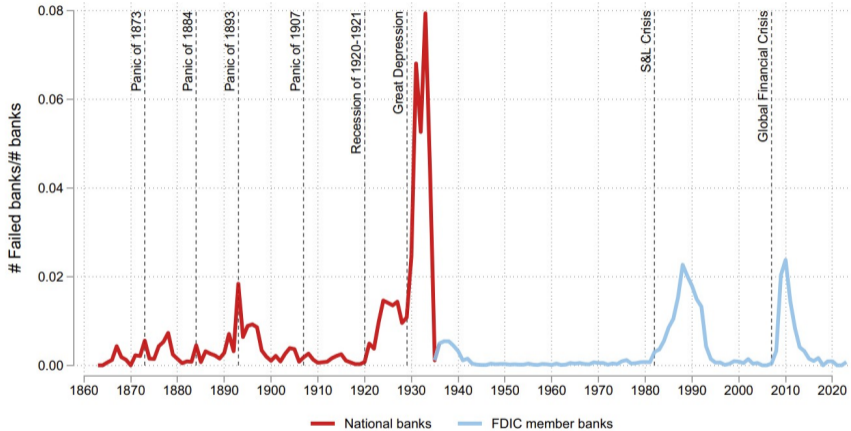
Federal Reserve Financial and Monetary History Conference  
May, 2026

# MACRO-FINANCIAL HISTORY: BANKING CRISES



Composite index of banking crises developed in [Jamilov et al. \(2025\)](#) based on: [Reinhart and Rogoff \(2009\)](#), [Jordà et al. \(2017\)](#), [Laeven and Valencia \(2018\)](#), [Baron et al. \(2021\)](#)

# BANK FAILURES



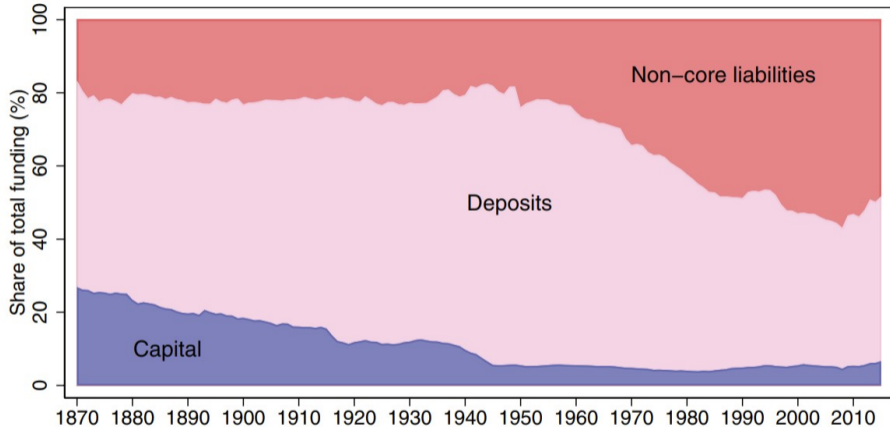
Source: Correia et al. (2026)

# RETAIL BANK RUNS



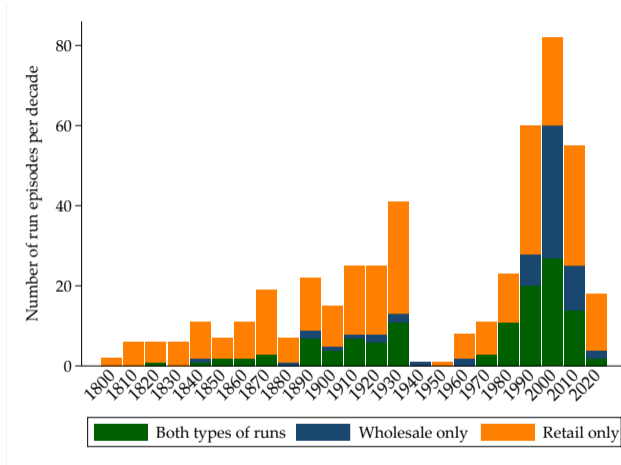
Source: Jamilov et al. (2025)

# THE RISE OF WHOLESALE FUNDING FOR BANKS



Source: Jordà et al. (2021)

# THIS PAPER: WHOLESALE FUNDING CRISES



► New chronology of wholesale funding crises for 147 countries over 1800-2024

# THIS PAPER

## Main Contribution

1. New chronology of **wholesale funding runs** for 147 countries over 1800-2024
2. New harmonized bank **funding data** for 188 countries over 1800-2024

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1. New chronology of **wholesale funding runs** for 147 countries over 1800-2024
2. New harmonized bank **funding data** for 188 countries over 1800-2024

## Questions and Analysis

- ▶ Wholesale **crises**: intersection of (1) and (2)
- ▶ **Fundamentalness** and predictability ex ante
- ▶ Macroeconomic and financial **consequences** ex post
- ▶ Categorical **decomposition** by wholesale crisis type
- ▶ The role of bank **regulation**

# MAIN FINDINGS

## 1. How common are wholesale runs?

- 1.5% (wholesale) vs. 2.4% (retail) over full sample
- More common for advanced economies
- 33% global, 16% regional, 11% geopolitical, 20% domestic, 20% idiosyncratic

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## 4. What is the role of deposit insurance?

- DI reallocates panic risk from retail to wholesale creditors

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  2. **JST database**: noncore ratios  $\times$  deposits  $\rightarrow$  wholesale funding
  3. **BIS Locational Banking Statistics**
  4. **OECD Banking Statistics**
  5. **Newly digitized national sources**

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Noncore = Foreign liabilities + Interbank liabilities + Securities + Loans + Derivatives

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- ▶ **Noncore funding definition** (Grimm, 2025):

Noncore = Foreign liabilities + Interbank liabilities + Securities + Loans + Derivatives
- ▶ **Retail deposit data**: from Jamilov et al. (2025)

# AI AGENT PIPELINE

**Starting point:** candidate events from our narrative bank runs, other crisis lists, and bottom 10th percentile non-core contractions

Core search prompt

ChatGPT and Claude prompts

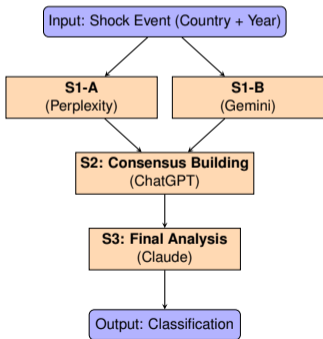
LLM Details

Narrative examples

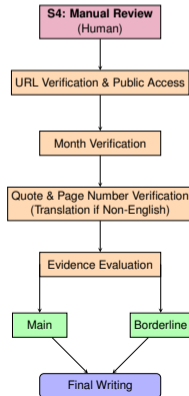
Languages

Borderline Cases

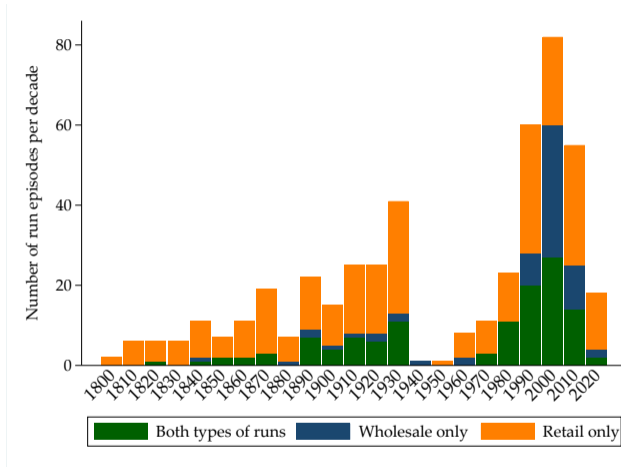
## LLM Stages



## S4: Human Review



# WHOLESALE RUNS ARE BECOMING MORE COMMON

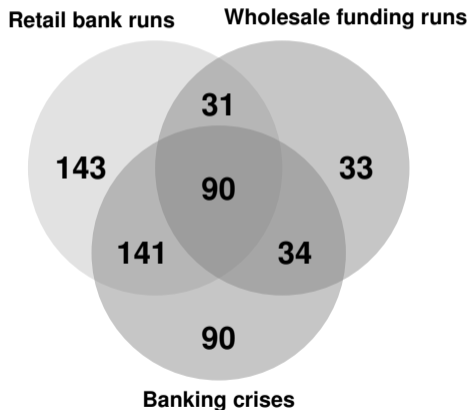


► Trend follows non-core financing shift; stronger for advanced economies

Advanced & Emerging

Frequencies

# WHOLESALE RUNS, RETAIL RUNS, AND BANKING CRISES



## Summary:

- ▶ 188 wholesale funding runs in total
- ▶ 33 only a wholesale run
- ▶ 31 also a retail run; 34 also a banking crisis
- ▶ 90 events feature all three

List examples

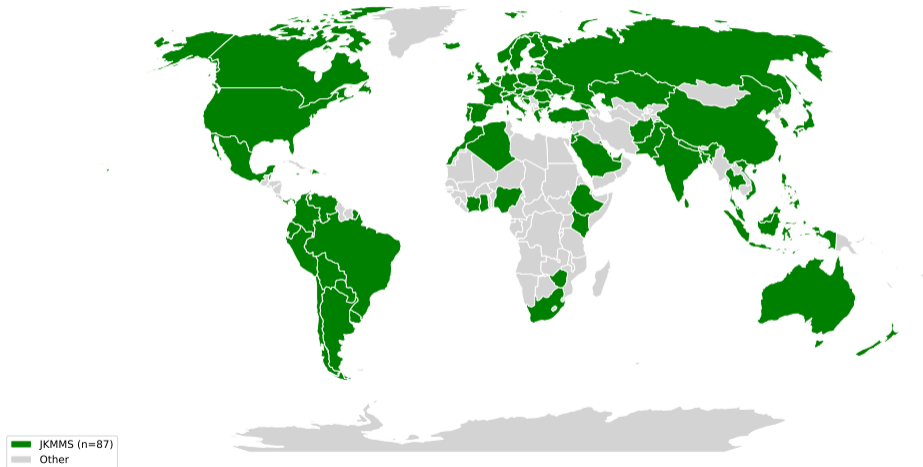
Conditional probabilities

Frequency table

Runs by year

# COUNTRY COVERAGE OF NARRATIVE RUNS

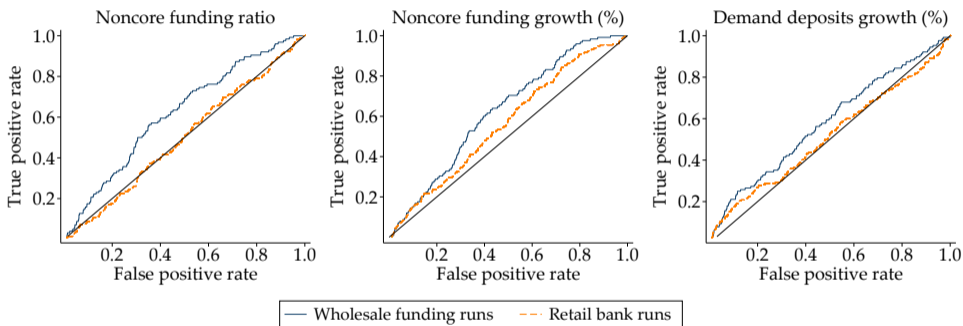
JKMMS Country Coverage



# DECOMPOSITION OF WHOLESALER RUNS BY CATEGORY

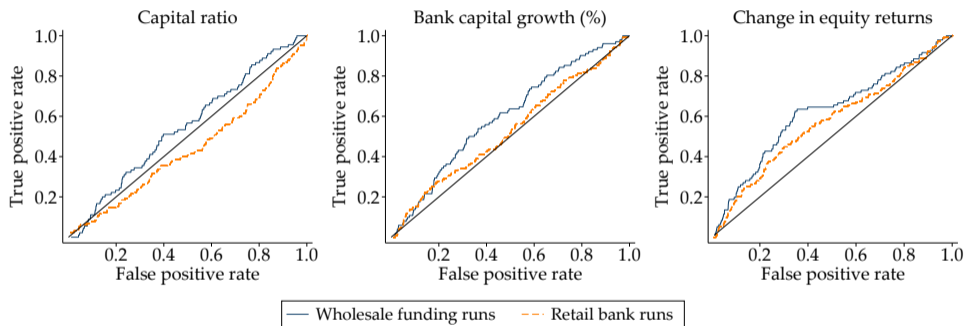
Category	Share	Description	Examples
<b>Global</b>	33.3%	Common shock to international funding hitting many countries at once	2008 GFC (49 countries); 1907 Panic (US, Sweden, Chile, Denmark, Mexico)
<b>Domestic</b>	19.8%	Country-specific macro or fiscal disturbance, including sovereign distress, BoP crises, hyperinflation etc.	Greece 2010 (sovereign-debt loop); Lebanon 2019; Sri Lanka 2022; Bulgaria 1996 (twin crisis)
<b>Idiosyncratic</b>	19.4%	Deteriorating condition of one or a small number of specific banks inside the fin. sector	Northern Rock UK 2007; SVB & Credit Suisse 2023; Continental Illinois 1984; Overend Gurney UK 1866
<b>Regional</b>	16.0%	Contagion from a neighbouring or economically linked country	Indonesia, Korea, Malaysia, Philippines 1997 (Asian crisis); Argentina 1994 (Tequila); Czech Rep., Hungary, Romania 1931
<b>Geopolitical</b>	11.4%	Discrete state action or act of war severing wholesale-funding channels	1914 WWI cluster (8 countries); Qatar 2017 (GCC blockade); Russia 2014 (sanctions); Afghanistan 2021

# WHOLESALE RUNS ARE FUNDAMENTAL: BANK FUNDING PREDICTORS



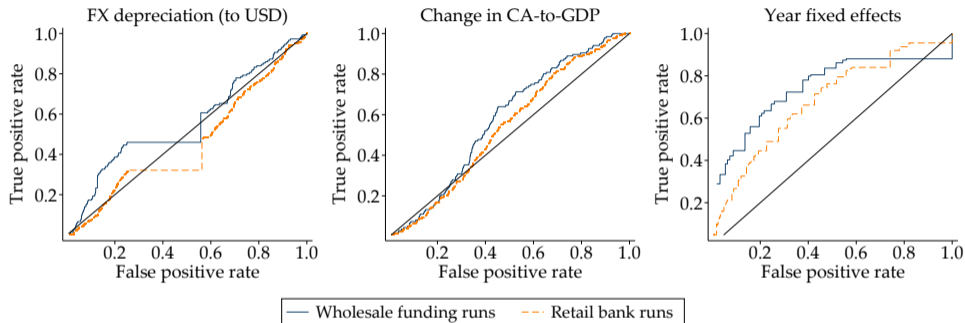
- ▶ Non-core funding expansions predict future wholesale funding crises
- ▶ Wholesale “boom and bust” cycles [Specification details](#)

# WHOLESALE CREDITORS REACT TO SOLVENCY CONCERNS



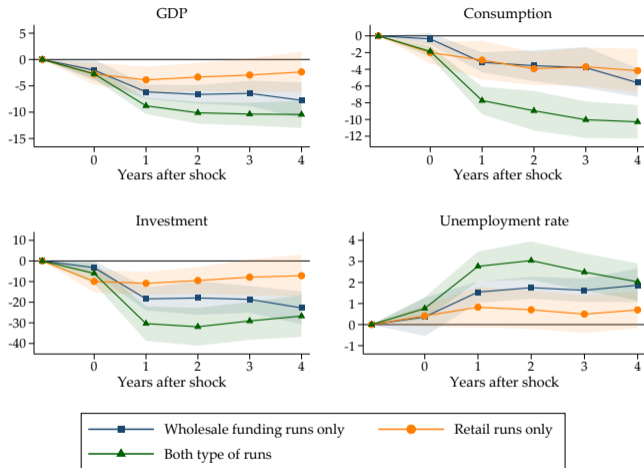
- ▶ Wholesale runs are predictable by solvency deteriorations Excluding borderline cases
- ▶ Institutional creditors better informed (Blickle et al., 2024)

# GLOBAL FACTORS PREDICT WHOLESALE RUNS



- ▶ Predictability with global factors, consistent with “sudden stop” dynamics
- ▶ Highlights the importance of international coordination of liquidity support

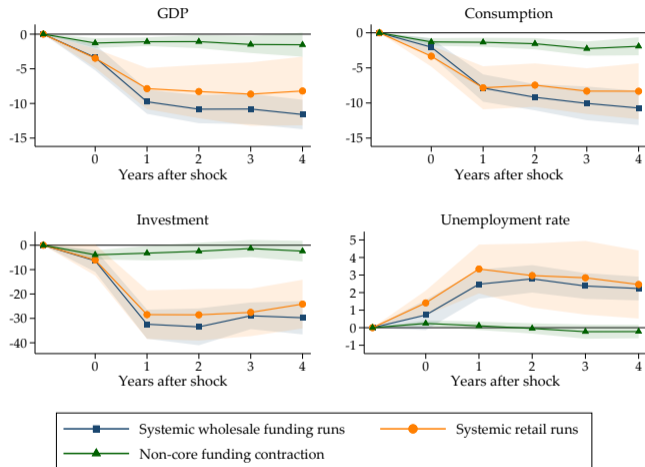
# NARRATIVE WHOLESALE VS RETAIL BANK RUNS



► Narrative wholesale runs have severe macroeconomics effects

LP details

# SYSTEMIC WHOLESALE CRISES



► Wholesale crises lead to larger and more persistent losses

No Borderline Cases

# DEPOSIT INSURANCE: PROTECTION OR RISK REALLOCATION?

- ▶ DI has expanded enormously since U.S. introduction in 1933
  - By early 2000s:  $\approx 80\%$  of high-income countries;  $\approx 50\%$  of middle/low-income (Demirgüç-Kunt et al., 2014)

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- ▶ **Intended benefit:** insured depositors have no incentive to run

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- ▶ **Intended benefit:** insured depositors have no incentive to run
- ▶ **Two concerns:**
  1. Moral hazard: explicit guarantees may incentivize excessive risk taking
  2. **Risk reallocation:** may *shift* runs from protected retail to unprotected wholesale creditors [Regression details](#)

# DEPOSIT INSURANCE SHIFTS RUN RISK TO WHOLESALE CREDITORS

	Systemic Wholesale (1)	Systemic Retail (2)	Systemic wholesale only (3)	Systemic retail only (4)
DI exists	0.03 (0.13)	-0.43*** (0.08)	<b>0.43***</b> <b>(0.11)</b>	<b>-0.15***</b> <b>(0.05)</b>
Country-level controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Mean of DV	0.67	0.44	0.46	0.15
Observations	84	208	84	208

## ► Substitutes, not complements or time trend

■ Standalone wholesale effect (3) > baseline (1)

■ **But** standalone (absolute) retail effect (4) < baseline (2)

Ex-ante funding

# CONCLUDING REMARKS

## Summary

- ▶ Wholesale crises the new frontier of systemic liquidity shocks
- ▶ Predictable (fundamental, not sunspot)  $\Rightarrow$  early warning indicators
- ▶ Damaging for GDP, investment, employment
- ▶ Deposit insurance reallocates fragility; volatility paradox (Krishnamurthy and Muir, 2025)

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## Next step in our agenda:

- ▶ “Running Towards Disaster: Bank Runs, Rare Disasters, and Asset Prices” (Hyland-Jamilov-König-Müller-Saidi, 2026)
- ▶ Equity risk premium in a model with rare banking disasters

# Appendix

# BORDERLINE CASES: DEFINITION AND EXAMPLES [BACK](#)

**Borderline:** Clear indicators of liquidity stress but lacking comprehensive documentation of institutional creditor panic

- ▶ Only 1–2 wholesale indicators (vs. multiple for main cases)
- ▶ Ambiguity about whether withdrawals were predominantly wholesale or retail
- ▶ Brief disruptions quickly resolved, or general descriptions without specific wholesale creditor evidence

## Examples:

- ▶ **Brazil 2008:** Foreign outflows documented (\$11.4bn in H2 2008) but evidence focuses on capital flow disruptions rather than wholesale funding market breakdown
- ▶ **Venezuela 2008:** Interbank rate tension documented but no clear evidence of sustained institutional creditor panic
- ▶ **U.S. March 2020:** Wholesale funding stress present (MMF outflows, LIBOR-OIS spike) but brief; “flow volatility for unsecured wholesale deposits...increased, but not as much” (Glasserman & Young 2024)

# AI PIPELINE: PROMPT AND TRAINING EXAMPLES BACK

## Core search prompt:

*“Is there STRONG or NO evidence of a wholesale bank run in {country} around {year}? Find  $\geq 10$  quotes from central bank reports, IMF/BIS documents, newspapers, or research papers documenting:*

1. Sudden withdrawal by institutional investors
2. Rapid decline in interbank lending
3. Sharp increases in wholesale funding costs
4. Unusual increases in collateral requirements
5. Foreign investors withdrawing capital
6. Decreased credit lines from other financial institutions

*Must include verbatim quote for crisis start month. Do not cite Wikipedia. Explore non-English sources. Always translate non-English quotes. Make sure the EXACT QUOTE EXISTS verbatim in the source.”*

## Examples provided to agents:

- ✓ **Positive (Argentina 1890):** “Banco Nacional’s financial position was weakened when it transferred assets to British creditors” (shows international wholesale creditor withdrawal)
- ✓ **Positive (Australia 1849):** “these institutions [Bank of Australasia and the Union Bank] withdrew their support” (explicit interbank withdrawal)
- × **Counter (Greece 1929):** “severe withdrawals of funds by depositors” (does not distinguish retail from wholesale)
- × **Counter (Montenegro 2008):** “depositors pulling 30% of holdings” + “emergency liquidity loan” (consistent with retail run; no wholesale-specific evidence)

# NARRATIVE EVIDENCE EXAMPLES [BACK](#)

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Country	Year	Evidence
Australia	1849	Derwent Bank survived earlier crises by interbank borrowing; peer institutions abruptly withdrew: <i>“the bank continued in operation until 1849 by borrowing from other banks”</i> (Fitz-Gibbon and Gizycki, 2001, p. 14); <i>“these institutions [Bank of Australasia and the Union Bank] <b>withdrew their support</b>”</i> (Australian Dictionary of Biography, 2006)
United States	1998	Russian default triggered institutional liquidity withdrawal: <i>“there was a <b>reduction in available liquidity</b>, as institutions with loanable funds reduced the volume of funds available to the market”</i> (Marshall, 2001, p. 4)
Poland	2008	Lehman collapse froze the interbank market: <i>“following the bankruptcy of US investment bank Lehman Brothers in late 2008, turnover on the Polish <b>interbank market collapsed</b>”</i> (Strojwas, 2010, p. 7)

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# LLM-ASSISTED CHRONOLOGY

[BACK](#)

**Definition:** Sudden withdrawal/withholding of liquidity by *non-retail* creditors, such as institutional investors, interbank lenders, foreign creditors

**Starting point:** Candidate events from JST, BVX, RR, LV, JKMS + bottom-10th-percentile noncore contractions (IFS, BIS)

## LLM-assisted human validation of runs:

- ▶ **S1:** Perplexity + Gemini (parallel search,  $\geq 10$  primary quotes, multilingual)
- ▶ **S2:** ChatGPT (quote authentication, consensus)
- ▶ **S3:** Claude (LaTeX formatting)
- ▶ **S4:** Human review of every event (URL, page, quote verification)

## Result: 188 wholesale runs, 82 countries

Source	Total	Match
JKMS (retail runs)	404	121
BVX (banking panics)	229	66
Reinhart-Rogoff	303	61
Laeven-Valencia	150	43
JST	88	31
<b>JKMMS (this paper)</b>	<b>188</b>	<b>33</b>

→ **33 events** not captured by *any* existing chronology

## Stage 2: ChatGPT prompt

```
{user_prompt}
```

Investigate the two responses. Double-check if the provided quotes are authentic.

```
You are given the following assessment from  
Perplexity: {perplexity_answer}
```

```
You are given the following assessment from  
Gemini: {gemini_answer}
```

Are there any fallacies in the reasoning? Write a brief paragraph on your reasoning whether Perplexity or Gemini agree (write: "AGREEMENT: YES") or disagree (write: "AGREEMENT: NO").

Following above, your task is to improve the writing.  
MAINTAIN THE LATEX FORMAT. Start with `\subsection`.

## Stage 3: Claude prompt

```
{user_prompt}
```

Investigate the two responses. Double-check if the provided quotes are authentic.

```
You are given: {perplexity_answer},  
{gemini_answer}, {chatgpt_answer}
```

Your task is to improve the writing. MAINTAIN THE LATEX FORMAT (e.g., use `10\%`). Start with `\subsection`.

**IMPORTANT: USE SOURCES AND REFERENCES BY PERPLEXITY AND GEMINI ONLY. DO NOT USE YOUR OWN SOURCES.**

# NON-ENGLISH PRIMARY SOURCES IN THE CHRONOLOGY [BACK](#)

A key advantage of the AI pipeline: access to non-English primary sources

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Language	Countries (selected episodes)
Spanish	Argentina (1914, 2001), Colombia (1982), Mexico (2008), Dominican Republic (2003), Venezuela (1994, 2008)
Portuguese	Brazil (2008), Portugal (1891)
French	Côte d'Ivoire (2008), Luxembourg (2007)
Dutch	Netherlands (1914, 2008)
German	Switzerland (1914)
Norwegian	Norway (1991, 2008)
Polish	Poland (2008)
Italian	Italy (1930)
Russian	Russia (2008)

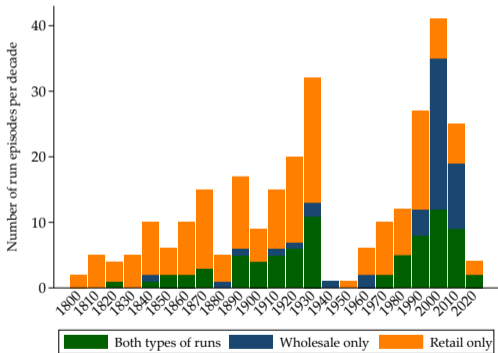
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Non-English quotes appear in footnotes with English translations throughout

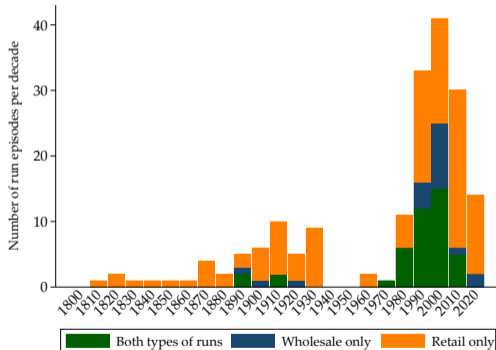
# WHOLESALE VS. RETAIL RUNS: ADVANCED AND EMERGING ECONOMIES

[BACK](#)

## Advanced Economies

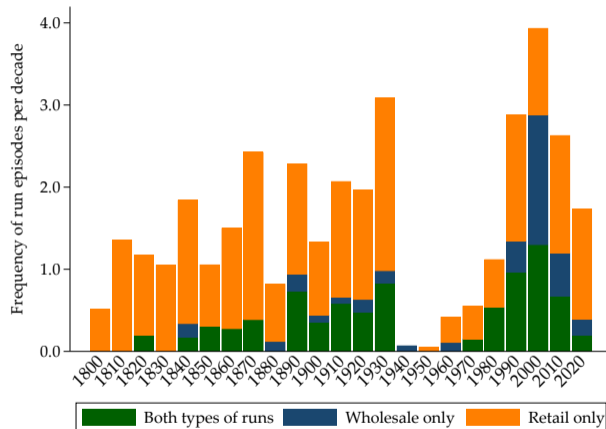


## Emerging Economies



# FREQUENCY OF WHOLESALE AND RETAIL RUNS

[BACK](#)



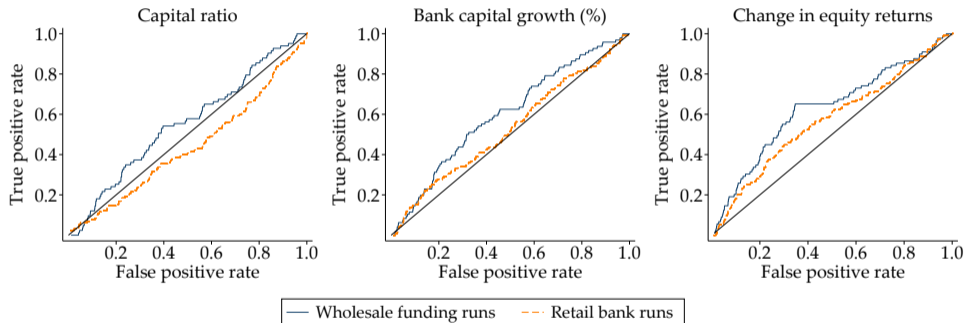
# CONDITIONAL PROBABILITIES: WHOLESALE AND RETAIL RUNS [BACK](#)

	Narrative wholesale run	Wholesale outflow	Systemic wholesale run	Non-systemic wholesale run
Unconditional	1.5	23.1	1.0	0.5
Conditional on a non-systemic retail run	33	49	17	16
Conditional on a systemic retail run	42	60	35	7
Conditional on a banking crisis	32	53	19	12
	Narrative retail run	Systemic retail run	Retail deposit outflow	Banking crisis
Unconditional	2.4	1.0	9.3	2.7
Conditional on a narrative wholesale run	56	26	32	51
Conditional on a wholesale funding outflow	9	3	22	9
Conditional on a systemic wholesale run	52	25	32	42
Conditional on a non-systemic wholesale run	59	12	18	55

Conditional probabilities use  $\pm 2$  year windows. Probabilities in percent.

# ROC CURVES: EXCLUDING BORDERLINE CASES

BACK



$$\Delta_h y_{i,t} = \alpha_i + \beta_h \mathbf{1}\{\text{Run}_{i,t-1}\} + \vartheta'_h \mathbf{X}_{i,t-1} + \varepsilon_{i,t+h}$$

where  $\Delta_h y_{i,t} \equiv y_{i,t+h} - y_{i,t}$ ,  $h \in \{0, \dots, 4\}$  years

- ▶ **Dependent variables:** log real GDP, real consumption, real investment, unemployment rate
- ▶ **Controls  $\mathbf{X}_{i,t-1}$ :** 1 lag each of GDP growth, consumption growth, investment growth,  $\Delta$  unemployment (lag length by AIC)
- ▶ **Data:** Global Macro Database (Müller et al., 2025), 157 countries, from early 19th century

*Note: Without an instrument for the run indicator,  $\beta_h$  captures the **conditional aftermath** of runs, not a causal effect*

# THE PREDICTORS OF WHOLESALERUNS BACK

For each run type  $r \in \{\text{Retail, Wholesale}\}$ :

$$\text{logit}(p_{it}^r) = \alpha^r + \beta^r(L) \mathbf{X}_{i,t-1} + \varepsilon_{it}^r$$

$\alpha^r$ : run-type intercept;  $\mathbf{X}_{i,t-1}$  includes country controls or year fixed effects  $\gamma_t$ .

**Three blocks of predictors** (calculated in a 4-year window  $[t-4, t-1]$  before the run):

## (a) Bank Funding

- ▶ Noncore funding ratio
- ▶ Noncore funding growth
- ▶ Demand deposits growth

## (b) Bank Solvency

- ▶ Capital ratio (book)
- ▶ Bank capital growth
- ▶ Change in equity returns

## (c) Global Factors

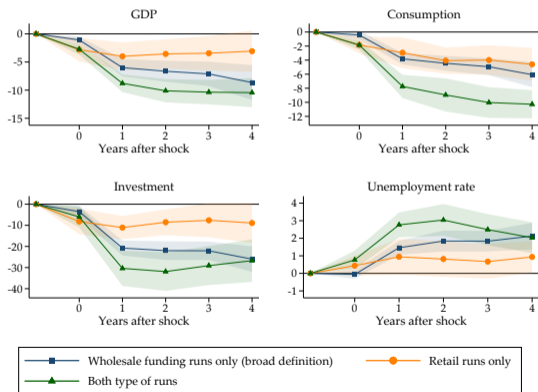
- ▶ FX depreciation (to USD)
- ▶ Change in CA-to-GDP
- ▶ Year fixed effects

**Key metric:** Area under ROC curve (AUC).  $\text{AUC} = 0.5 \Rightarrow$  no predictive power;  
 $\text{AUC} > 0.5$ : increase in predictor value  $\Rightarrow$  increase in run probability

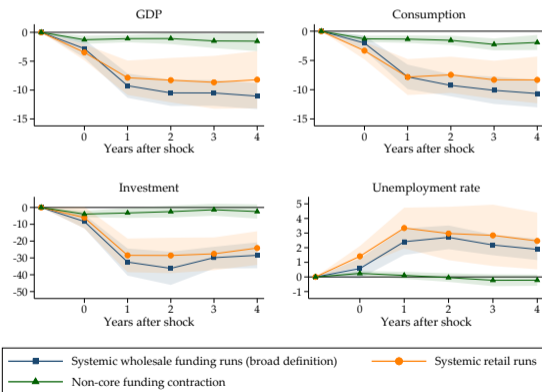
# MACROECONOMIC AFTERMATH: EXCLUDING BORDERLINE CASES

BACK

## All types: excl. borderline



## Systemic runs: excl. borderline



# DEPOSIT INSURANCE: DETAILS [BACK](#)

- ▶ **Formal test:** linear probability model:

$$\mathbf{1}\{\text{Run}_{i,t}^{\text{systemic}}\} = \alpha_i + \beta_1 \mathbf{1}_{i,t}^{\text{DI,pred}} + \vartheta X_{i,t-1} + \varepsilon_{i,t}$$

Estimated on: (i) sample of wholesale run episodes; (ii) sample of retail run episodes

- ▶ Standalone test: systemic wholesale *without* systemic retail, and vice versa

# SELECTED HISTORICAL WHOLESALE RUN EPISODES

[BACK](#)

Country	Year	Episode summary	Liability growth
United Kingdom	1890	Baring crisis: London interbank panic, EM contagion	—
United States	1907	Knickerbocker Trust, interbank market freeze	> 0
Austria	1931	Credit-Anstalt collapse, Central European contagion	—
Spain	1931	Banco de Cataluña cut off from interbank sources	−4.8%
Venezuela	1994	Banco Latino excluded from interbank mechanism	−31.6%
South Korea	1997	International creditors withdraw short-term credit lines	−33.8%
Zimbabwe	2003	Wholesale run following ENG asset management failure	−2.0%
Iceland	2008	Foreign wholesale funding collapse	−50.2%
Ireland	2007	Property-driven noncore funding dry-up	−12.0%
Greece	2010	Interbank market exclusion	−20.6%

Liability growth = year-on-year growth of affected liabilities.

# HOW LIKELY ARE WHOLESALE AND RETAIL RUNS?

[BACK](#)

	Narrative wholesale run	Wholesale funding outflow	Systemic wholesale run	Non- systemic wholesale run
Unconditional	1.4	24.2	0.9	0.4
Cond. on a non-systemic retail run	36	62	18	18
Cond. on a systemic retail run	44	80	37	7
Cond. on a banking crisis	34	68	21	13
	Narrative retail run	Systemic retail run	Retail deposit outflow	Banking crisis
Unconditional	2.4	1.0	9.3	2.7
Cond. on a narrative wholesale run	58	28	47	57
Cond. on a wholesale funding outflow	7	2	15	8
Cond. on a systemic wholesale run	54	27	49	50
Cond. on a non-systemic wholesale run	63	12	24	57

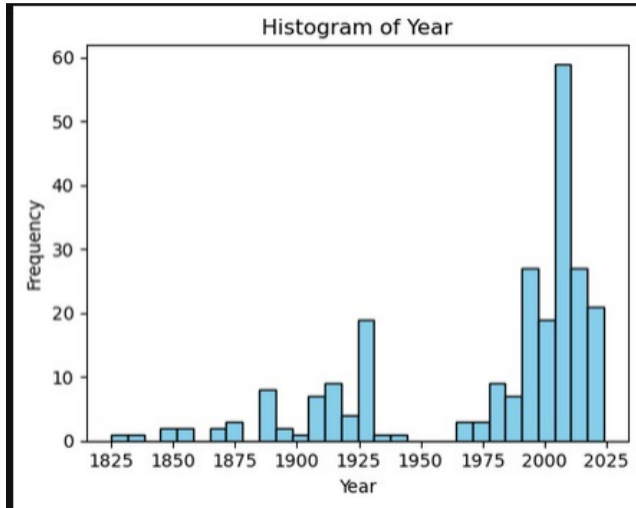
# DEPOSIT INSURANCE WITH EX-ANTE FUNDING

[BACK](#)

	<b>Systemic Wholesale</b> (1)	<b>Systemic Retail</b> (2)	<b>Systemic wholesale only</b> (3)	<b>Systemic retail only</b> (4)
DI with ex-ante funding	0.04 (0.16)	-0.37*** (0.09)	<b>0.35**</b> <b>(0.14)</b>	<b>-0.15**</b> <b>(0.06)</b>
Country-level controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Mean of DV	0.67	0.44	0.46	0.15
Observations	84	205	84	205

# WHOLESALE RUNS BY YEAR

[BACK](#)



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