Wholesale funding runs

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Motivation

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  - Repurchase agreements, interbank debt, certificates of deposit

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  - Retail depositors are insured
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  - Asymmetric information can lead to adverse selection / freezes

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  - Retail depositors are insured
  - Wholesale lenders are uninsured
  - Asymmetric information can lead to adverse selection / freezes
- **Wholesale funding penalized by new liquidity regulation**
  - Tarullo (2014): "*The LCR* [liquidity coverage ratio] *should also encourage banks to reduce the use of very short-term wholesale funding that increases buffer* [of high-quality assets] *requirements.*"

Hypothesis

- **Theory: Asymmetric information induces adverse selection**
  - High- and low-quality banks are indistinguishable by lenders
  - Good banks can be prevented from borrowing
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- **Two null hypotheses**
  - **H1:** High- and low-quality banks are equally likely to lose access to wholesale funding in times of stress
  - **H2:** When runs occur, the cross-sectional reallocation of funds is random.

The paper

- **Ideal laboratory: certificate of deposit (CD) market**
  - Unsecured $\rightarrow$ Asymmetric information on credit risk, not collateral
  - Lenders are money market funds $\rightarrow$ No liquidity hoarding
  - Large cross-section of runs over 2008-2014 period
  - No previous studies on this market

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  - Weaker on observable characteristics
  - Runs forecast lower future performance
  - Future well-performing banks increase funding during market stress

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- **No evidence that asymmetric information is first-order**
  - Potential explanation for market resilience
  - Potential challenge for imposing regulatory liquidity ratios

Data on certificates of deposits

- **Certificate of deposit (CD) contract**
  - Issued by credit institutions
  - Initial maturity between one day and one year
  - Unsecured
  - Minimum amount EUR 150,000 per CD
  - Issued over-the-counter, placed mostly to money market funds

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- **CD dataset**
  - From Banque de France, over 2008-2014 period
  - 1,383,202 ISIN-level observations, with 838,703 individual ISINs
  - All events affecting an ISIN: issuance, re-issuance, buybacks
  - Volume and maturity data

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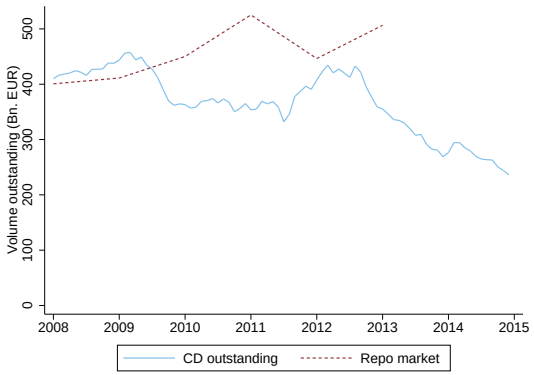
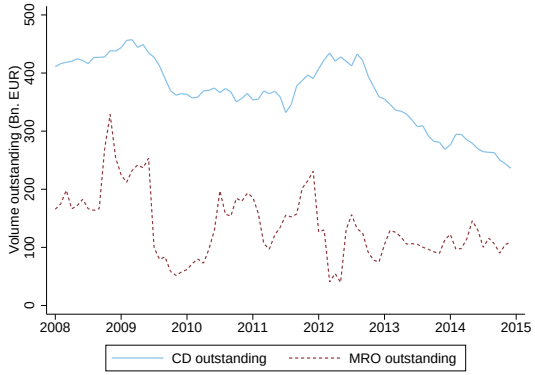
- **More than 80% of all euro-denominated CDs**

CD market versus other wholesale markets

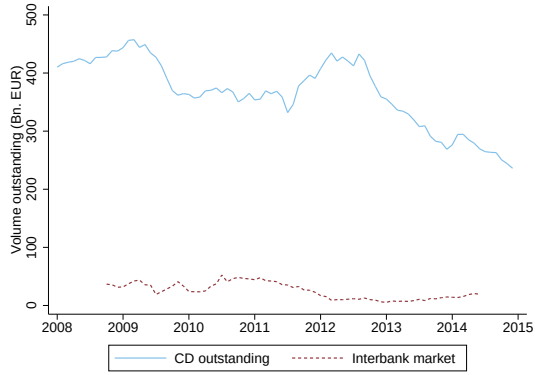
CD vs. repo



CD vs. ECB



CD vs. interbank



- Similar size as the repo market
- Larger than ECB funding and unsecured interbank market
- No system-wide freeze in CD market → [See]

CD issuers

- **CD issuers**
  - 276 individual issuers
  - 196 French, 80 from IT, DE, UK, NL, IE, etc.
  - Most large European banks are in the data

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  - Most large European banks are in the data
- **Matching with balance sheet and market data**
  - 263 issuers matched with balance sheet data from Bankscope
  - Short-term credit ratings, primarily from Fitch
  - Stock price and CDS spread data from Bloomberg

The importance of bank-specific runs

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  - Full run: Amount outstanding falls to zero
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  - Exclude if less than 1 issuance per week before run
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  - CDs cheaper that interbank loans [See] and ECB funding $\rightarrow$ [See]
  - Maturity shortening before runs $\rightarrow$ [See table]
  - Use Factiva to collect news around runs

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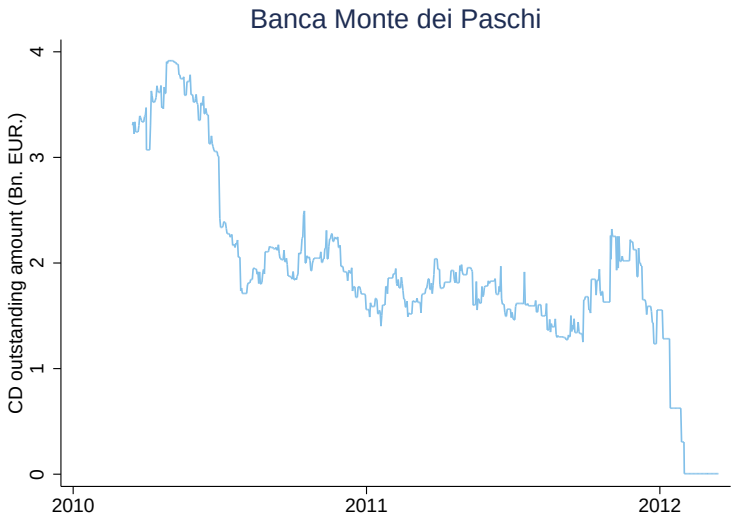
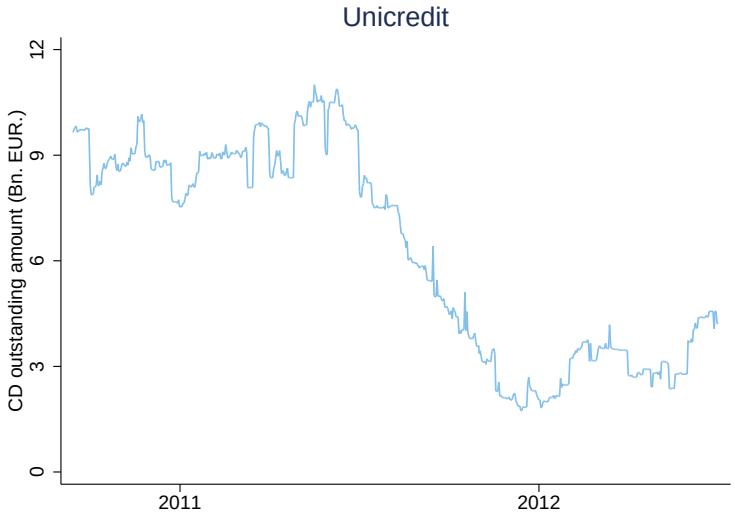
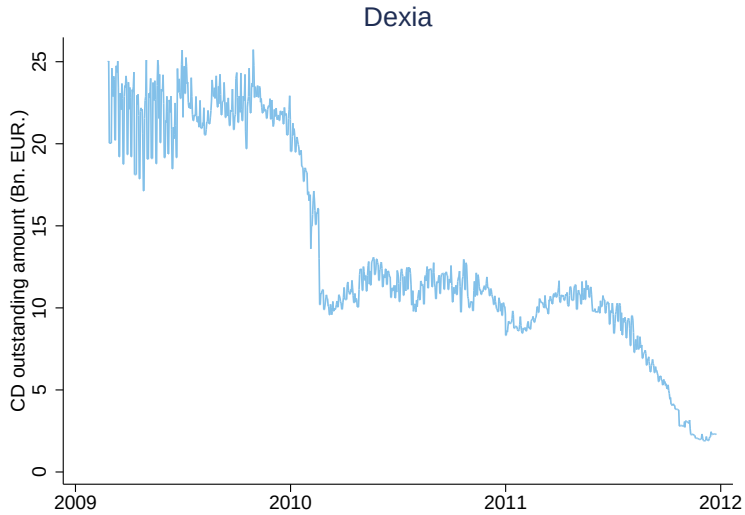
- **Demand driven?**
  - CDs cheaper that interbank loans [See] and ECB funding $\rightarrow$ [See]
  - Maturity shortening before runs $\rightarrow$ [See table]
  - Use Factiva to collect news around runs
- **75 runs, including 29 full runs**

Examples of runs

- **2 full and 2 partial runs**







Timeline of full runs

- **Year with highest number of runs is 2011**

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Observable characteristics before runs

- **Banks facing a run are weaker on observables**

	One year before run		Two years before run	
	Diff. from mean	Diff. from median	Diff. from mean	Diff. from median
ROA	-1.249***	-0.577***	-0.271	-0.150**
Net income / Assets	-0.014***	-0.006***	-0.003	-0.002**
Impaired loans / Equity	55.879***	52.790***	22.362	11.234*
Equity / Assets	-0.036***	-0.033***	-0.032**	-0.024***
CDS spread	82.180	110.245**	0.041	10.584
Short-term credit rating	-0.424***	-0.474**	-0.320**	-0.118

Runs predict future bank characteristics

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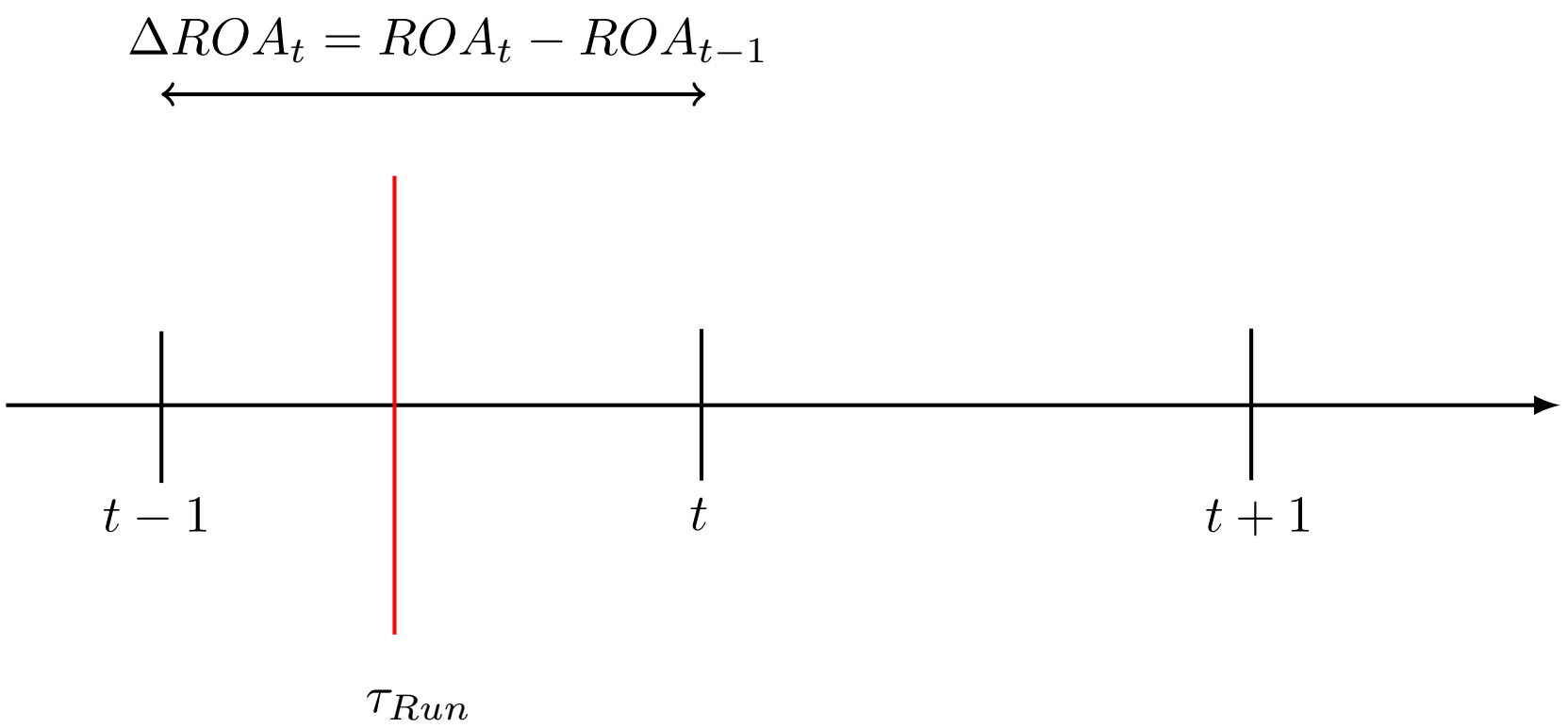
- **Base regression**

$$\begin{aligned}\Delta ROA_{it} &= \beta_0 \mathbb{1}\left\{t-1 \leq \tau_{Run_i} < t\right\} + \beta_1 \text{Size}_{i,t-1} + \beta_2 \text{Controls}_{i,t-1} \\ &\quad + \beta_3 \text{Controls}_{c,t-1} + FE_c + FE_t + \varepsilon_{i,t},\end{aligned}$$

  - $\Delta ROA_{it} = ROA_{it} - ROA_{it-1}$
  - β_0 coefficient of interest

Runs predict future bank characteristics



Runs predict future bank characteristics

- **Facing a run predicts a decrease in ROA**

Dependent variable: $\Delta ROA = ROA_t - ROA_{t-1}$

	Baseline		Share CD	Crisis
Run	-0.341**	-0.508***	-0.874***	-0.610***
	(0.135)	(0.139)	(0.176)	(0.143)
Size_{t-1}		-0.018	-0.004	-0.017
		(0.025)	(0.025)	(0.025)
ROA_{t-1}		-0.713***	-0.717***	-0.717***
		(0.038)	(0.037)	(0.038)
Impaired / Loans_{t-1}		-0.025***	-0.026***	-0.026***
		(0.009)	(0.009)	(0.009)
GDP growth		38.957***	37.561***	38.732***
		(4.969)	(4.955)	(4.954)
Run $*$ Share CD $\in [4\%, 9\%]$			0.372	
			(0.407)	
Run $*$ Share CD $\geq 9\%$			0.351	
			(0.302)	
Run $*$ Crisis				0.133
				(0.192)
Adj. R^2	-0.001	0.407	0.415	0.411
N. Obs.	948	684	684	684

Endogeneity concerns

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  - Can runs *cause* decreases in ROA?

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- **Reverse causality**
  - Can runs *cause* decreases in ROA?
- **Three solutions**
  - Use changes in impaired loans as dependent variable → [See results]
  - Interact *Run* dummy with share of CD funding → [See results]
  - Banks do not downsize significantly → No fire sales [See results]

Consistency checks

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  - ΔROA and impaired loans at 2-year horizon

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- **Predictability remains with high market stress**
  - Interact *Run* dummy with *Crisis* dummy (2011-2012) [See results]

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  - ΔROA and impaired loans at 2-year horizon
- **Predictability remains with high market stress**
  - Interact *Run* dummy with *Crisis* dummy (2011-2012) [See results]
- **Runs predict high-frequency market outcomes**
  - Baseline regression with ΔCDS and excess stock return

Runs predict future market outcomes

- **Facing a run predicts an increase in CDS spread**
  - Predicts negative excess stock return, but insignificant

	Δ *CDS spread*			
	6 months		1 year	
Run	36.443**	49.033***	43.824*	61.896**
	(15.748)	(17.577)	(25.510)	(28.891)
Size_{t-1}		-0.707		-1.680
		(0.901)		(1.770)
ROA_{t-1}		-2.354		3.948
		(1.552)		(2.756)
Impaired / Loans_{t-1}		-2.041**		-2.410**
		(0.787)		(1.180)
GDP growth		-1214.823*		-2187.64
		(650.329)		(1437.262)
Adj. R^2	0.570	0.585	0.563	0.573
N. Obs.	2,099	956	1,937	956

Reallocation

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- **Issuance in excess of the market**

$$E_{it} = \Big[\log(CD_{it}) - \log(CD_{i,t-1})\Big] - \Big[\log(CD_{mt}) - \log(CD_{m,t-1})\Big]$$

  - CD_{it}: Outstanding amount by i in month t
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- **Probit specification**

$$\begin{aligned}\Pr(I_{it} = 1|X_t) &= \Phi\big(\beta_0 \Delta ROA_{it} + \beta_1 \text{Controls}_{i,t-1} \\ &\quad + \beta_2 \text{Controls}_{c,t-1} + FE_c + FE_m\big)\end{aligned}$$

  - $I_{it} = 1$ if E_{it} above median or 75th percentile

Reallocation

- **Banks increasing ROA increase relative CD funding**
  - ... Regardless of whether market is stressed

	Dependent variable: Prob. of CD issuance in excess of the market	
	Above median	Above 75th percentile
Δ ROA	0.024^{***}	0.031^{**}
	(0.005)	(0.014)
N. Obs.	10,979	10,979

Reallocation in times of stress

- **Run Index**

$$RunIndex_t = \frac{\sum_i R_{it}}{CD_{mt}},$$

  - R_{it}: Euro amount of run by i at t.
  - CD_{mt}: Aggregate CD market size at t
  - Computed at monthly frequency $\rightarrow$ [See index]

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- **Interact ΔROA with quantiles of Run Index**
  - If effect magnified $\rightarrow$ Accelerated reallocation
  - If effect disappears $\rightarrow$ Suggests contagion

Reallocation in times of stress

- **Reallocation magnified when market stress is high**
  - ... Increasing in quantiles of the Run Index

	Dependent variable: Prob. of CD issuance in excess of the market			
	Above median		Above 75th percentile	
Δ ROA	0.024***	0.018**	0.031**	0.016***
	(0.005)	(0.009)	(0.014)	(0.006)
Δ ROA * Run Index in Quartile 2		-0.003		0.008
		(0.016)		(0.006)
Δ ROA * Run Index in Quartile 3		0.033***		0.039
		(0.012)		(0.033)
Δ ROA * Run Index in Quartile 4		0.048**		0.030**
		(0.020)		(0.015)
N. Obs.	10,979	10,979	10,979	10,979

Related literature

- **Asymmetric information / Adverse selection (Akerlof, 1970)**
  - In lender-borrower relationships: Stiglitz & Weill (1981)
  - In wholesale markets: Heider et al. (2015)

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- **Resilience of wholesale markets**
  - **Repo:** Gorton & Metrick (2012), Krishnamurthy et al. (2014), Copeland et al. (2014), Boissel et al. (2015), Mancini et al. (2015)
  - **Counterparty risk vs. liquidity hoarding**: Afonso et al. (2011)
    - $\rightarrow$ Focus on asymmetric information is new
    - $\rightarrow$ First study on the European CD market

Conclusion and implications

- **No evidence that asymmetric information is first-order**
  - No market freeze
  - Runs predict low future performance
  - Reallocation not random $\rightarrow$ From low- to high-quality banks

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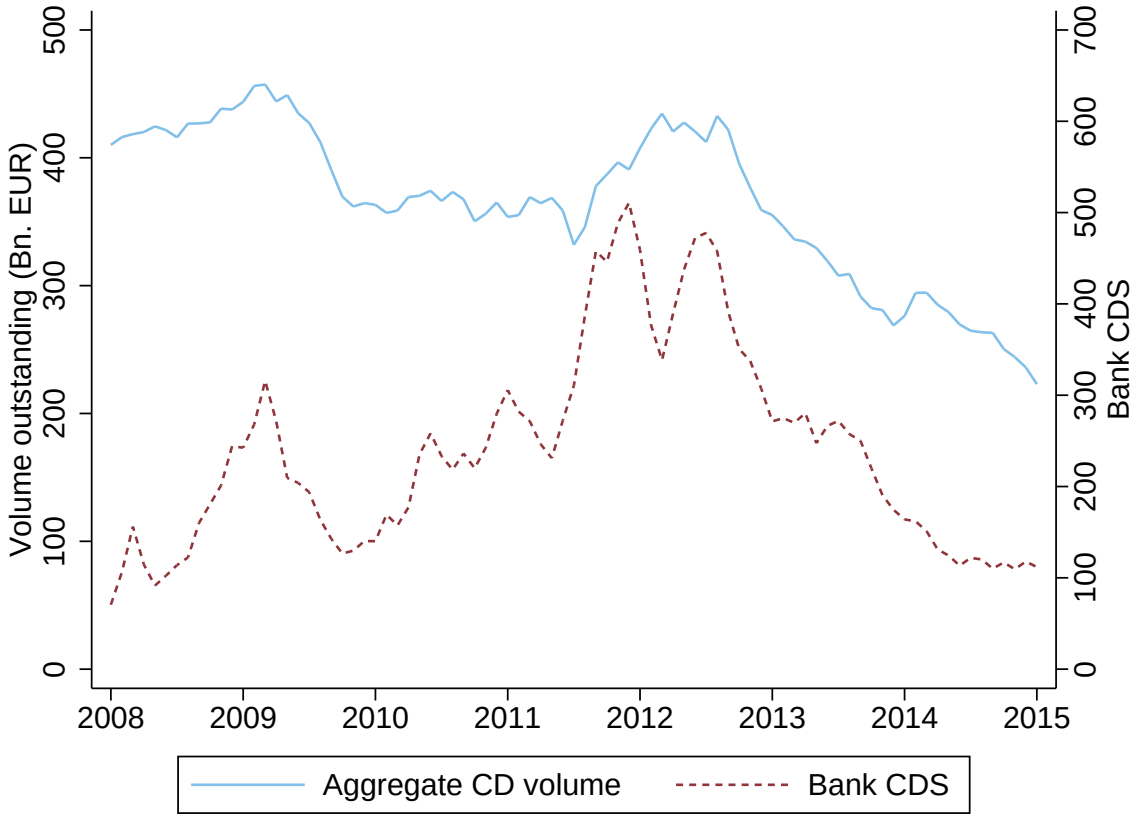
  - Reallocation not random $\rightarrow$ From low- to high-quality banks
- **Low asymmetric information can explain market resilience**
  - Challenges the premise of regulatory liquidity ratio
  - However, no account for externalities arising from runs
- **Lender of last resort most likely to benefit weakest banks**
  - Consistent with empirical evidence (Drechsel et al. JF 2015)
  - ... But in contrast with received theory

The absence of market freeze

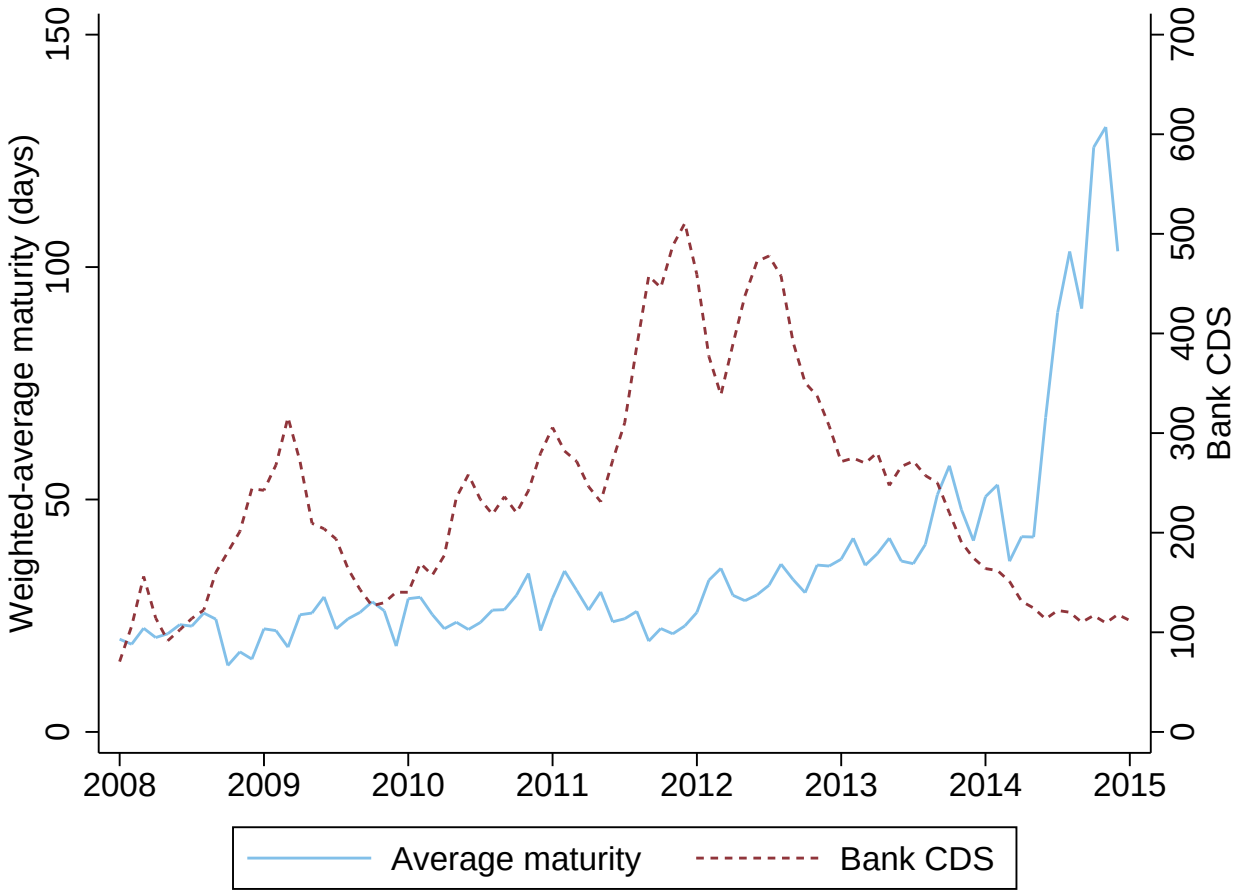
- **No system-wide drop in volume**
  - ... Even when CDS spreads increase



Back

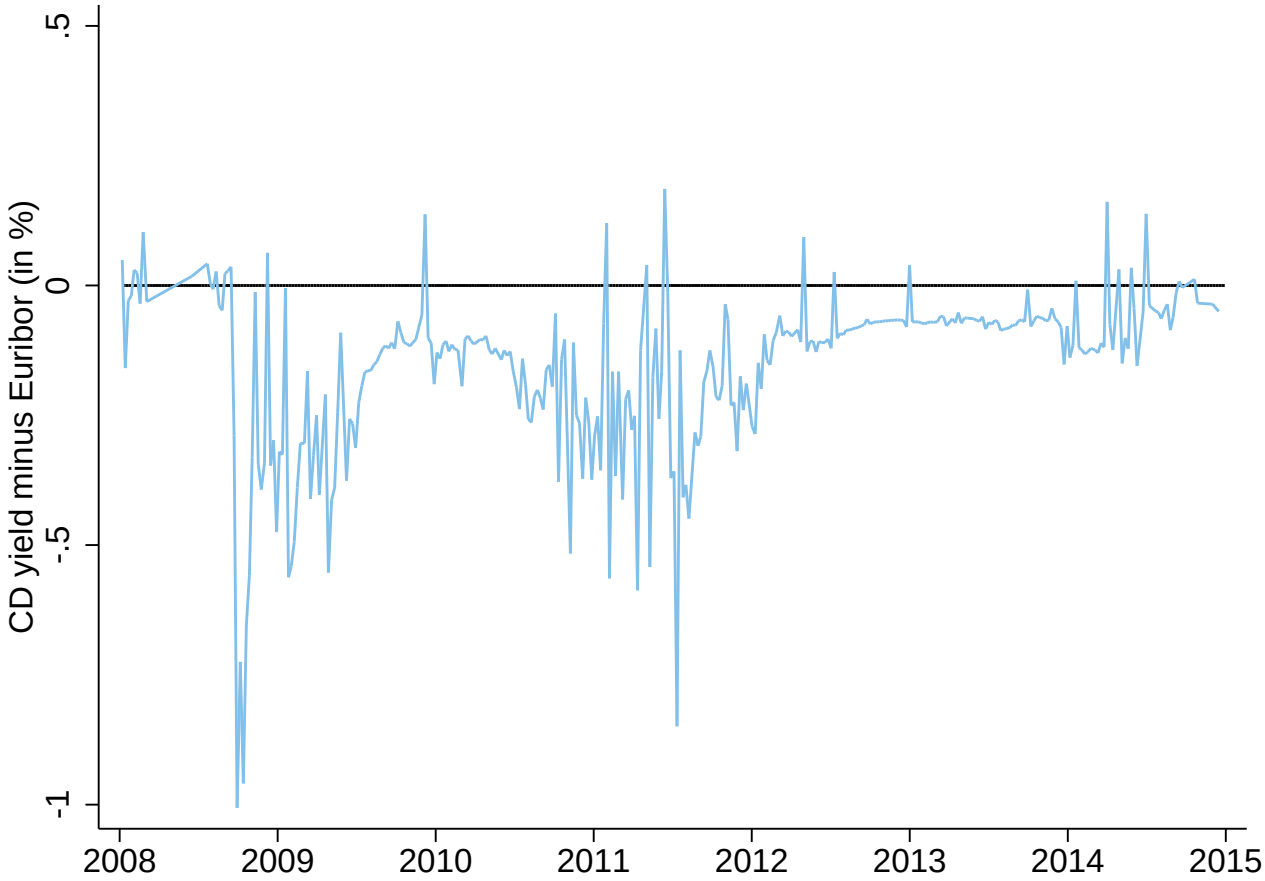
Average maturity of new issues

- **No system-wide drop in average maturity**



CD Yields

- Negative spread with the Euribor of same maturity



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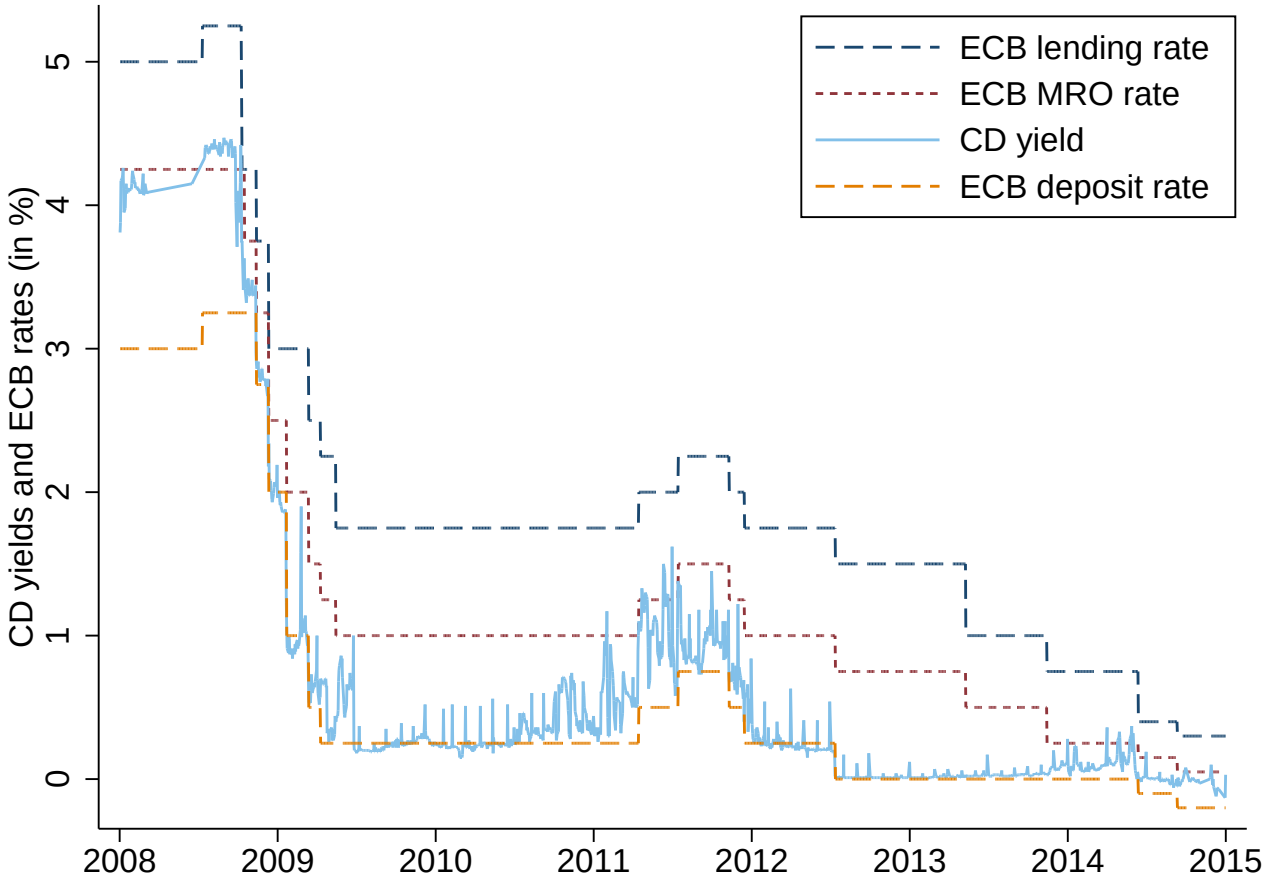
CD Yields

- **Yields on CDs with initial maturity up to 7 days**



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Maturity shortening before runs

- **Maturity of new issues shortens before runs**
  - Within-issuer variation, with time fixed effects

	Dependent variable: Weighted average maturity of new issues	
	Panel A: Partial and full runs	*Panel B: Full runs only*
$\tau - 1$	-24.660***	-29.732***
	(2.281)	(4.521)
$\tau - 2$	-17.278***	-30.198***
	(3.939)	(6.004)
$\tau - 3$	-12.134***	-14.664***
	(1.699)	(4.742)
$\tau - 4$	-7.628	-11.610
	(4.902)	(7.368)
$\tau - 5$	-7.506*	-3.930
	(3.750)	(5.243)
$\tau - 6$	-0.689	15.504***
	(4.132)	(3.858)
Adj. R^2	0.166	0.165
N. Obs.	11,420	11,420

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Runs predict future bank characteristics

- **Facing a run predicts an increase in impaired loans**

Dependent variable: Δ Impaired loans / Loans

	Baseline		Share CD	Crisis
Run	0.582***	0.507***	0.640***	0.612***
	(0.139)	(0.138)	(0.177)	(0.151)
Size_{t-1}		-0.038	-0.042*	-0.040
		(0.025)	(0.025)	(0.025)
ROA_{t-1}		-0.011	-0.010	-0.007
		(0.038)	(0.038)	(0.038)
Impaired / Loans_{t-1}		-0.017*	-0.017*	-0.017*
		(0.009)	(0.009)	(0.009)
GDP growth		-24.918***	-24.463***	-24.706***
		(5.044)	(5.068)	(5.031)
Run $*$ Share CD $\in [4\%, 9\%]$			-0.490	
			(0.385)	
Run $*$ Share CD $\geq 9\%$			-0.233	
			(0.306)	
Run $*$ Crisis				-0.052
				(0.093)
Adj. R^2	0.100	0.140	0.140	0.145
N. Obs.	676	675	675	675

Back

Endogeneity checks

- **Effect not magnified for banks with large CD exposure**

Dependent variable: $\Delta ROA = ROA_t - ROA_{t-1}$

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		(4.969)	(4.955)	(4.954)
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Endogeneity checks

- **Facing a run does not predict a decrease in size**

Dependent variable: Δ Size

	Baseline		Share CD	Crisis
Run	-0.039	-0.014	-0.008	-0.019
	(0.035)	(0.013)	(0.017)	(0.018)
Size_{t-1}		-0.005**	-0.005**	-0.005**
		(0.003)	(0.002)	(0.002)
ROA_{t-1}		0.008**	0.008**	0.008**
		(0.003)	(0.003)	(0.003)
Impaired / Loans_{t-1}		-0.000	-0.000	-0.000
		(0.001)	(0.001)	(0.001)
GDP growth		0.028	0.054	0.014
		(0.497)	(0.500)	(0.497)
Run $*$ Share CD $\in [4\%, 9\%]$			-0.009	
			(0.041)	
Run $*$ Share CD $\geq 9\%$			-0.017	
			(0.030)	
Run $*$ Crisis				0.008
				(0.007)
Adj. R^2	0.031	0.197	0.195	0.198
N. Obs.	950	685	685	685

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Consistency checks

- **Predictability remains when market stress is high**

Dependent variable: $\Delta ROA = ROA_t - ROA_{t-1}$

	Baseline		Share CD	Crisis
Run	-0.341**	-0.508***	-0.874***	-0.610***
	(0.135)	(0.139)	(0.176)	(0.143)
Size_{t-1}		-0.018	-0.004	-0.017
		(0.025)	(0.025)	(0.025)
ROA_{t-1}		-0.713***	-0.717***	-0.717***
		(0.038)	(0.037)	(0.038)
Impaired / Loans_{t-1}		-0.025***	-0.026***	-0.026***
		(0.009)	(0.009)	(0.009)
GDP growth		38.957***	37.561***	38.732***
		(4.969)	(4.955)	(4.954)
Run $*$ Share CD $\in [4\%, 9\%]$			0.372	
			(0.407)	
Run $*$ Share CD $\geq 9\%$			0.351	
			(0.302)	
Run $*$ Crisis				0.133
				(0.192)
Adj. R^2	-0.001	0.407	0.415	0.411
N. Obs.	948	684	684	684

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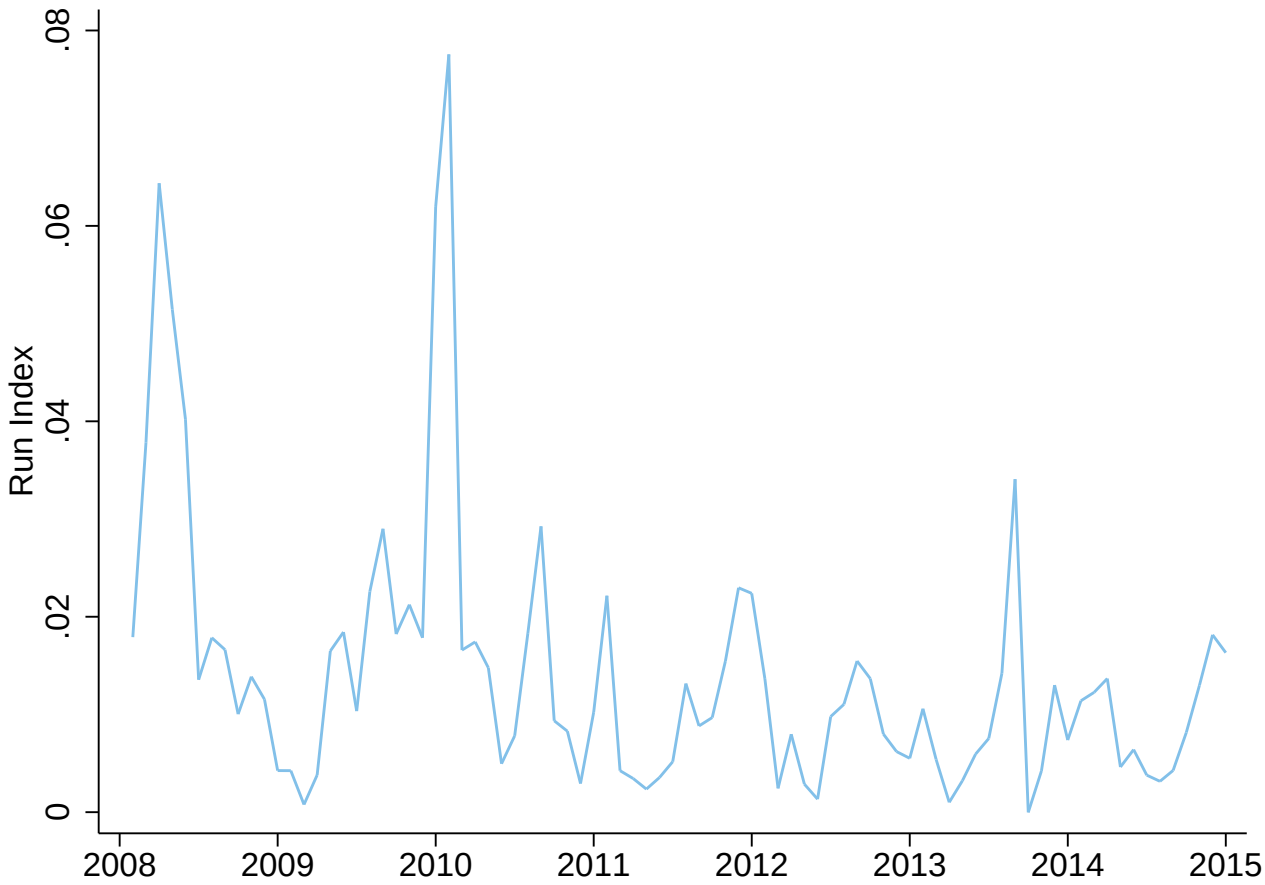
Run Index

- **Captures number and magnitude of runs**
  - Both partial and full



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