Wholesale funding runs

Christophe Pérignon  David Thesmar  Guillaume Vuilleme

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Université Paris Dauphine

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Motivation

- Wholesale funding growing source of bank funding
  - Repurchase agreements, interbank debt, certificates of deposit

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]."
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- **Wholesale funding growing source of bank funding**
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- **Prevailing view: Wholesale funding subject to market freezes**
  - Retail depositors are insured
  - Wholesale lenders are uninsured
  - 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
  - Freezes more likely in stress periods $\rightarrow$ Higher dispersion of quality
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- **Bank quality**
  - Quality not defined based on observables
  - Proxy for unobserved quality: future performance
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- **Bank quality**
  - Quality not defined based on observables
  - Proxy for unobserved quality: future performance

- **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 → Asymmetric information on credit risk, not collateral
  - Lenders are money market funds → No liquidity hoarding
  - Large cross-section of runs over 2008-2014 period
  - No previous studies on this market
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- **Banks facing runs significantly weaker**
  - Weaker on observable characteristics
  - Runs forecast lower future performance
  - Future well-performing banks increase funding during market stress
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- **Banks facing runs significantly weaker**
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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
Data on certificates of deposits

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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

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

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

- 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

- Definitions of runs
  - Full run: Amount outstanding falls to zero
  - Partial runs: Loses 50% or more in 50 days or less

Measurement

Exclude issuers with < 100 million EUR before runs
Exclude if less than 1 issuance per week before run
Exclude mergers, acquisitions, nationalizations

Demand driven?
CDs cheaper than interbank loans [See] and ECB funding

Maturity shortening before runs [See table]

Use Factiva to collect news around runs

75 runs, including 29 full runs
The importance of bank-specific runs

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Wholesale funding runs
The importance of bank-specific runs

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The importance of bank-specific runs

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Demand driven?

- CDs cheaper than interbank loans [See] and ECB funding → [See]
- Maturity shortening before runs → [See table]
- Use Factiva to collect news around runs

75 runs, including 29 full runs
Examples of runs

- 2 full and 2 partial runs

Banca Monte dei Paschi

Allied Irish Banks PLC

Unicredit

Dexia
Timeline of full runs

Year with highest number of runs is 2011

Outstanding amount 50 days before run (EUR Mn)
# Observable characteristics before runs

Banks facing a run are weaker on observables

<table>
<thead>
<tr>
<th></th>
<th>One year before run</th>
<th>Two years before run</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diff. from mean</td>
<td>Diff. from median</td>
</tr>
<tr>
<td>ROA</td>
<td>-1.249***</td>
<td>-0.577***</td>
</tr>
<tr>
<td>Net income / Assets</td>
<td>-0.014***</td>
<td>-0.006***</td>
</tr>
<tr>
<td>Impaired loans / Equity</td>
<td>55.879***</td>
<td>52.790***</td>
</tr>
<tr>
<td>Equity / Assets</td>
<td>-0.036***</td>
<td>-0.033***</td>
</tr>
<tr>
<td>CDS spread</td>
<td>82.180</td>
<td>110.245**</td>
</tr>
<tr>
<td>Short-term credit rating</td>
<td>-0.424***</td>
<td>-0.474**</td>
</tr>
</tbody>
</table>
H1: High- and low-quality banks are equally likely to lose access to wholesale funding in times of stress
**H1:** High- and low-quality banks are equally likely to lose access to wholesale funding in times of stress

**Base regression**

\[
\Delta ROA_{it} = \beta_0 \mathbb{1}\{t - 1 \leq \tau_{Run_i} < t\} + \beta_1 \text{Size}_{i,t-1} + \beta_2 \text{Controls}_{i,t-1} \\
+ \beta_3 \text{Controls}_{c,t-1} + FE_c + FE_t + \varepsilon_{i,t},
\]

- \(\Delta ROA_{it} = ROA_{it} - ROA_{it-1}\)
- \(\beta_0\) coefficient of interest
Runs predict future bank characteristics

\[ \Delta ROA_t = ROA_t - ROA_{t-1} \]

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Wholesale funding runs
## Runs predict future bank characteristics

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

**Dependent variable:** \( \Delta ROA = ROA_t - ROA_{t-1} \)

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Share CD</th>
<th>Crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run</td>
<td>-0.341**</td>
<td>-0.508***</td>
<td>-0.874***</td>
</tr>
<tr>
<td>( \text{Size}_{t-1} )</td>
<td>-0.018</td>
<td>-0.004</td>
<td>-0.017</td>
</tr>
<tr>
<td>( \text{ROA}_{t-1} )</td>
<td>-0.713***</td>
<td>-0.717***</td>
<td>-0.717***</td>
</tr>
<tr>
<td>( \text{Impaired} / \text{Loans}_{t-1} )</td>
<td>-0.025***</td>
<td>-0.026***</td>
<td>-0.026***</td>
</tr>
<tr>
<td>GDP growth</td>
<td>38.957***</td>
<td>37.561***</td>
<td>38.732***</td>
</tr>
<tr>
<td>Run ( \times ) Share CD ( \in ) [4%, 9%]</td>
<td></td>
<td>0.372</td>
<td>(0.407)</td>
</tr>
<tr>
<td>Run ( \times ) Share CD ( \geq ) 9%</td>
<td></td>
<td>0.351</td>
<td>(0.302)</td>
</tr>
<tr>
<td>Run ( \times ) Crisis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adj. ( R^2 )</td>
<td>-0.001</td>
<td>0.407</td>
<td>0.415</td>
</tr>
<tr>
<td>N. Obs.</td>
<td>948</td>
<td>684</td>
<td>684</td>
</tr>
</tbody>
</table>

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Wholesale funding runs
Endogeneity concerns

- **Reverse causality**
  - Can runs *cause* decreases in ROA?
Endogeneity concerns

- **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]
Predictability extends to longer-term outcomes

$\Delta ROA$ and impaired loans at 2-year horizon
Consistency checks

- Predictability extends to longer-term outcomes
  - $\Delta ROA$ and impaired loans at 2-year horizon

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

- **Predictability extends to longer-term outcomes**
  - $\Delta ROA$ 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 $\Delta CDS$ 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

## $\Delta CDS$ spread

<table>
<thead>
<tr>
<th></th>
<th>6 months</th>
<th>1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run</td>
<td>36.443**</td>
<td>43.824*</td>
</tr>
<tr>
<td></td>
<td>(15.748)</td>
<td>(25.510)</td>
</tr>
<tr>
<td>Size$_{t-1}$</td>
<td>-0.707</td>
<td>-1.680</td>
</tr>
<tr>
<td></td>
<td>(0.901)</td>
<td>(1.770)</td>
</tr>
<tr>
<td>ROA$_{t-1}$</td>
<td>-2.354</td>
<td>3.948</td>
</tr>
<tr>
<td></td>
<td>(1.552)</td>
<td>(2.756)</td>
</tr>
<tr>
<td>Impaired / Loans$_{t-1}$</td>
<td>-2.041**</td>
<td>-2.410**</td>
</tr>
<tr>
<td></td>
<td>(0.787)</td>
<td>(1.180)</td>
</tr>
<tr>
<td>GDP growth</td>
<td>-1214.823*</td>
<td>-2187.64</td>
</tr>
<tr>
<td></td>
<td>(650.329)</td>
<td>(1437.262)</td>
</tr>
</tbody>
</table>

| Adj. $R^2$     | 0.570          | 0.563          |
| N. Obs.        | 2,099          | 1,937          |

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Wholesale funding runs
Reallocation

- **H2:** When runs occur, cross-sectional reallocation is random.
Reallocation

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**Issuance in excess of the market**

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

- \(CD_{it}\): Outstanding amount by \(i\) in month \(t\)
- \(CD_{mt}\): Aggregate size of CD market in month \(t\)
Reallocation

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  \]

  - \( CD_{it} \): Outstanding amount by \( i \) in month \( t \)
  - \( CD_{mt} \): Aggregate size of CD market in month \( t \)

- **Probit specification**

  \[
  \Pr (I_{it} = 1|X_t) = \Phi \left( \beta_0 \Delta ROA_{it} + \beta_1 \text{Controls}_{i,t-1} + \beta_2 \text{Controls}_{c,t-1} + FE_c + FE_m \right)
  \]

  - \( I_{it} = 1 \) if \( E_{it} \) above median or 75th percentile
Banks increasing ROA increase relative CD funding

... Regardless of whether market is stressed

<table>
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<tr>
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<th>Above median</th>
<th>Above 75th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta$ ROA</td>
<td>0.024*** (0.005)</td>
<td>0.031** (0.014)</td>
</tr>
<tr>
<td>N. Obs.</td>
<td>10,979</td>
<td>10,979</td>
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</table>

Dependent variable: Prob. of CD issuance in excess of the market

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Reallocating in times of stress

**Run Index**

\[ \text{RunIndex}_t = \sum_i \frac{R_{it}}{CD_{mt}}, \]

- \( R_{it} \): Euro amount of run by \( i \) at \( t \).
- \( CD_{mt} \): Aggregate CD market size at \( t \).
- Computed at monthly frequency → [See index]
Re allocation in times of stress

- **Run Index**

  \[
  \text{RunIndex}_t = \frac{\sum_i R_{it}}{CD_{mt}},
  \]

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

- **Interact \(\Delta ROA\) with quantiles of Run Index**
  - If effect magnified → Accelerated reallocation
  - If effect disappears → Suggests contagion
### Reallocation in times of stress

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

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<tr>
<td>$\Delta \text{ROA} \times \text{Run Index in Quartile 2}$</td>
<td>-0.003 (0.016)</td>
<td>0.008 (0.006)</td>
</tr>
<tr>
<td>$\Delta \text{ROA} \times \text{Run Index in Quartile 3}$</td>
<td>0.033*** (0.012)</td>
<td>0.039 (0.033)</td>
</tr>
<tr>
<td>$\Delta \text{ROA} \times \text{Run Index in Quartile 4}$</td>
<td>0.048** (0.020)</td>
<td>0.030** (0.015)</td>
</tr>
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<td>10,979</td>
<td>10,979</td>
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Dependent variable:
Prob. of CD issuance in excess of the market

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Wholesale funding runs
Related literature

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

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- **Resilience of wholesale markets**
  - **Counterparty risk vs. liquidity hoarding**: Afonso et al. (2011)
    - Focus on asymmetric information is new
    - 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 → 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
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- **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
Average maturity of new issues

- No system-wide drop in average maturity

![Chart showing the weighted-average maturity (days) for average maturity and Bank CDS from 2008 to 2015. The chart indicates that there is no system-wide drop in average maturity during this period.](chart.png)
CD Yields

- Negative spread with the Euribor of same maturity

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Wholesale funding runs
Yields on CDs with initial maturity up to 7 days
Maturity shortening before runs

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

<table>
<thead>
<tr>
<th>Dependent variable: Weighted average maturity of new issues</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: Partial and full runs</strong></td>
</tr>
<tr>
<td>( \tau - 1 )</td>
</tr>
<tr>
<td>( \tau - 2 )</td>
</tr>
<tr>
<td>( \tau - 3 )</td>
</tr>
<tr>
<td>( \tau - 4 )</td>
</tr>
<tr>
<td>( \tau - 5 )</td>
</tr>
<tr>
<td>( \tau - 6 )</td>
</tr>
<tr>
<td><strong>Panel B: Full runs only</strong></td>
</tr>
<tr>
<td>( \tau - 1 )</td>
</tr>
<tr>
<td>( \tau - 2 )</td>
</tr>
<tr>
<td>( \tau - 3 )</td>
</tr>
<tr>
<td>( \tau - 4 )</td>
</tr>
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<tr>
<td>( \tau - 6 )</td>
</tr>
<tr>
<td>Adj. ( R^2 )</td>
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Runs predict future bank characteristics

- Facing a run predicts an increase in impaired loans

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<th>Crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run</td>
<td>0.582***</td>
<td>0.507***</td>
<td>0.640***</td>
</tr>
<tr>
<td></td>
<td>(0.139)</td>
<td>(0.138)</td>
<td>(0.177)</td>
</tr>
<tr>
<td>Size_{t-1}</td>
<td>-0.038</td>
<td>-0.042*</td>
<td>-0.040</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.025)</td>
<td>(0.025)</td>
</tr>
<tr>
<td>ROA_{t-1}</td>
<td>-0.011</td>
<td>-0.010</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
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<td>(0.038)</td>
</tr>
<tr>
<td>Impaired / Loans_{t-1}</td>
<td>-0.017*</td>
<td>-0.017*</td>
<td>-0.017*</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.009)</td>
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<td></td>
<td>(5.044)</td>
<td>(5.068)</td>
<td>(5.031)</td>
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<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.490</td>
<td></td>
<td>-0.52</td>
</tr>
<tr>
<td></td>
<td>(0.385)</td>
<td></td>
<td>(0.093)</td>
</tr>
<tr>
<td>Run * Share CD ≥ 9%</td>
<td></td>
<td>-0.233</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.306)</td>
<td></td>
</tr>
<tr>
<td>Run * Crisis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>0.100</td>
<td>0.140</td>
<td>0.140</td>
</tr>
<tr>
<td>N. Obs.</td>
<td>676</td>
<td>675</td>
<td>675</td>
</tr>
</tbody>
</table>

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Christophe Pérignon, David Thesmar, Guillaume Vuillemey

Wholesale funding runs
Endogeneity checks

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

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

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Share CD</th>
<th>Crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run</td>
<td>-0.341** (0.135)</td>
<td>-0.508*** (0.139)</td>
<td>-0.874*** (0.176)</td>
</tr>
<tr>
<td>Size(_{t-1})</td>
<td>-0.018 (0.025)</td>
<td>-0.004 (0.025)</td>
<td>-0.017 (0.025)</td>
</tr>
<tr>
<td>ROA(_{t-1})</td>
<td>-0.713*** (0.038)</td>
<td>-0.717*** (0.037)</td>
<td>-0.717*** (0.038)</td>
</tr>
<tr>
<td>Impaired / Loans(_{t-1})</td>
<td>-0.025*** (0.009)</td>
<td>-0.026*** (0.009)</td>
<td>-0.026*** (0.009)</td>
</tr>
<tr>
<td>GDP growth</td>
<td>38.957*** (4.969)</td>
<td>37.561*** (4.955)</td>
<td>38.732*** (4.954)</td>
</tr>
<tr>
<td>Run * Share CD (\in [4%, 9%])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Run * Share CD (\geq 9%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Run * Crisis</td>
<td></td>
<td></td>
<td>0.133 (0.192)</td>
</tr>
</tbody>
</table>

Adj. \( R^2 \)  
N. Obs.  
948  
684  
684  
684
# Endogeneity checks

## Facing a run does not predict a decrease in size

Dependent variable: $\Delta$ Size

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Share CD</th>
<th>Crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run</td>
<td>-0.039</td>
<td>-0.014</td>
<td>-0.008</td>
</tr>
<tr>
<td></td>
<td>(0.035)</td>
<td>(0.013)</td>
<td>(0.017)</td>
</tr>
<tr>
<td>$\text{Size}_{t-1}$</td>
<td>-0.005**</td>
<td>(0.003)</td>
<td>-0.005**</td>
</tr>
<tr>
<td>ROA$_{t-1}$</td>
<td>0.008**</td>
<td>0.008**</td>
<td>0.008**</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Impaired / Loans$_{t-1}$</td>
<td>-0.000</td>
<td>-0.000</td>
<td>-0.000</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>GDP growth</td>
<td>0.028</td>
<td>0.054</td>
<td>0.014</td>
</tr>
<tr>
<td></td>
<td>(0.497)</td>
<td>(0.500)</td>
<td>(0.497)</td>
</tr>
<tr>
<td>Run $\times$ Share CD $\in [4%, 9%]$</td>
<td></td>
<td>-0.009</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.041)</td>
<td></td>
</tr>
<tr>
<td>Run $\times$ Share CD $\geq 9%$</td>
<td></td>
<td>-0.017</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.030)</td>
<td></td>
</tr>
<tr>
<td>Run $\times$ Crisis</td>
<td></td>
<td>0.008</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>(0.007)</td>
<td></td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>0.031</td>
<td>0.197</td>
<td>0.195</td>
</tr>
<tr>
<td>N. Obs.</td>
<td>950</td>
<td>685</td>
<td>685</td>
</tr>
</tbody>
</table>
Consistency checks

**Predictability remains when market stress is high**

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

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<tr>
<td></td>
<td>(4.969)</td>
<td>(4.955)</td>
<td>(4.954)</td>
</tr>
<tr>
<td>Run * Share CD $\in [4%, 9%]$</td>
<td></td>
<td></td>
<td>0.372</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.407)</td>
</tr>
<tr>
<td>Run * Share CD $\geq 9%$</td>
<td></td>
<td></td>
<td>0.351</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.302)</td>
</tr>
<tr>
<td>Run * Crisis</td>
<td></td>
<td></td>
<td>0.133</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>(0.192)</td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>-0.001</td>
<td>0.407</td>
<td>0.415</td>
</tr>
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<td>N. Obs.</td>
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Wholesale funding runs
Run Index

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

![Graph of Run Index from 2008 to 2015](image-url)