An Historical Loss Approach to Community Bank Stress Testing

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Primary Objective

- Introduce a community bank macro stress-testing model that
  - provides a realistic worst-case forecasts at a high confidence level
  - poses no additional regulatory burden on banks
  - can be run quarterly by banks and/or regulators similar to the Fed's Economic Value Model

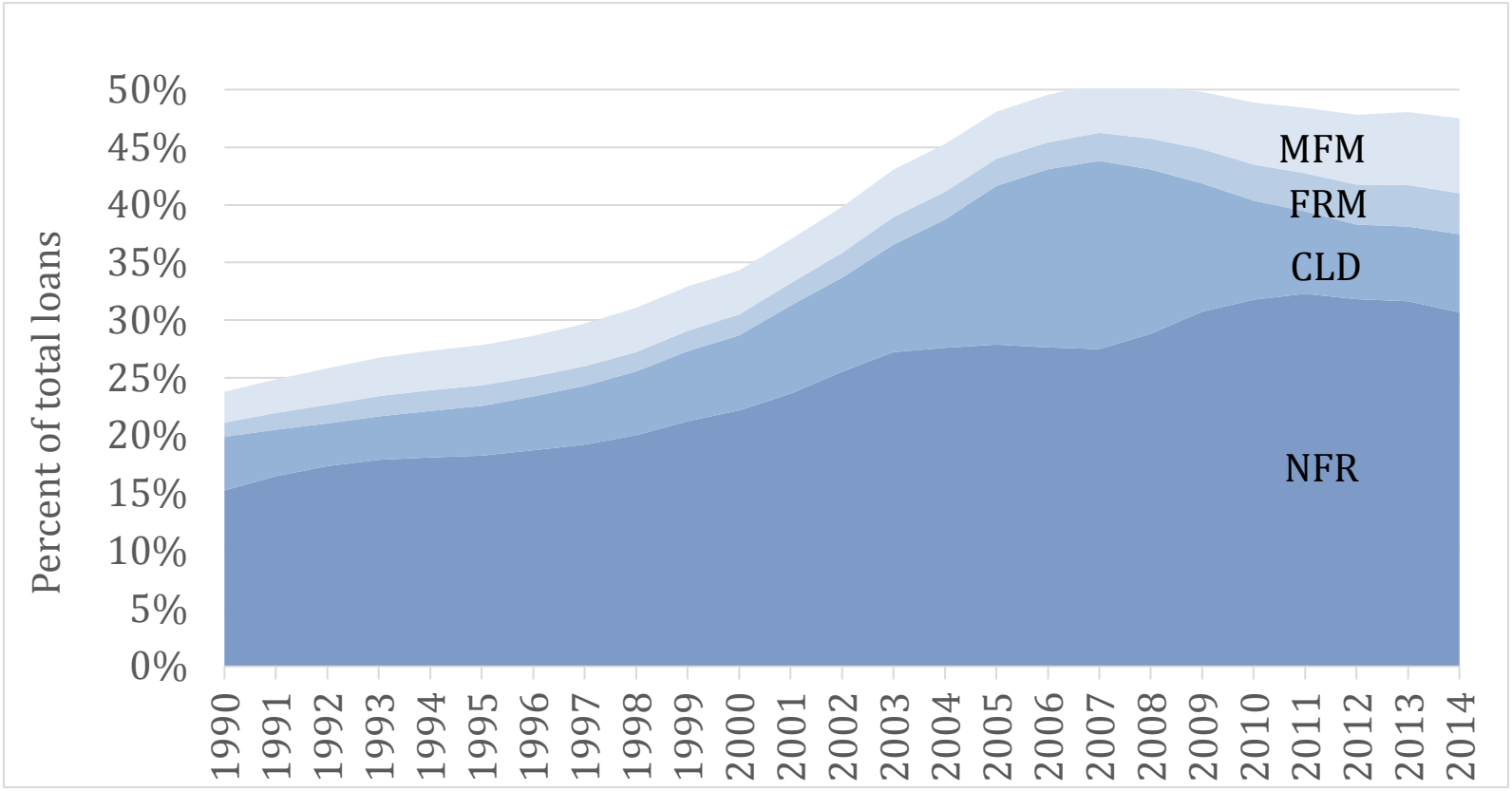
Why is a stress test needed?

- Traditional early warning signals
  - are static and cannot account for abrupt and severe changes in banking & economic conditions
  - failed to perceive the magnitude of the banking downturn.
  - Basel II capital ratios were about to be *lowered* in 2008!

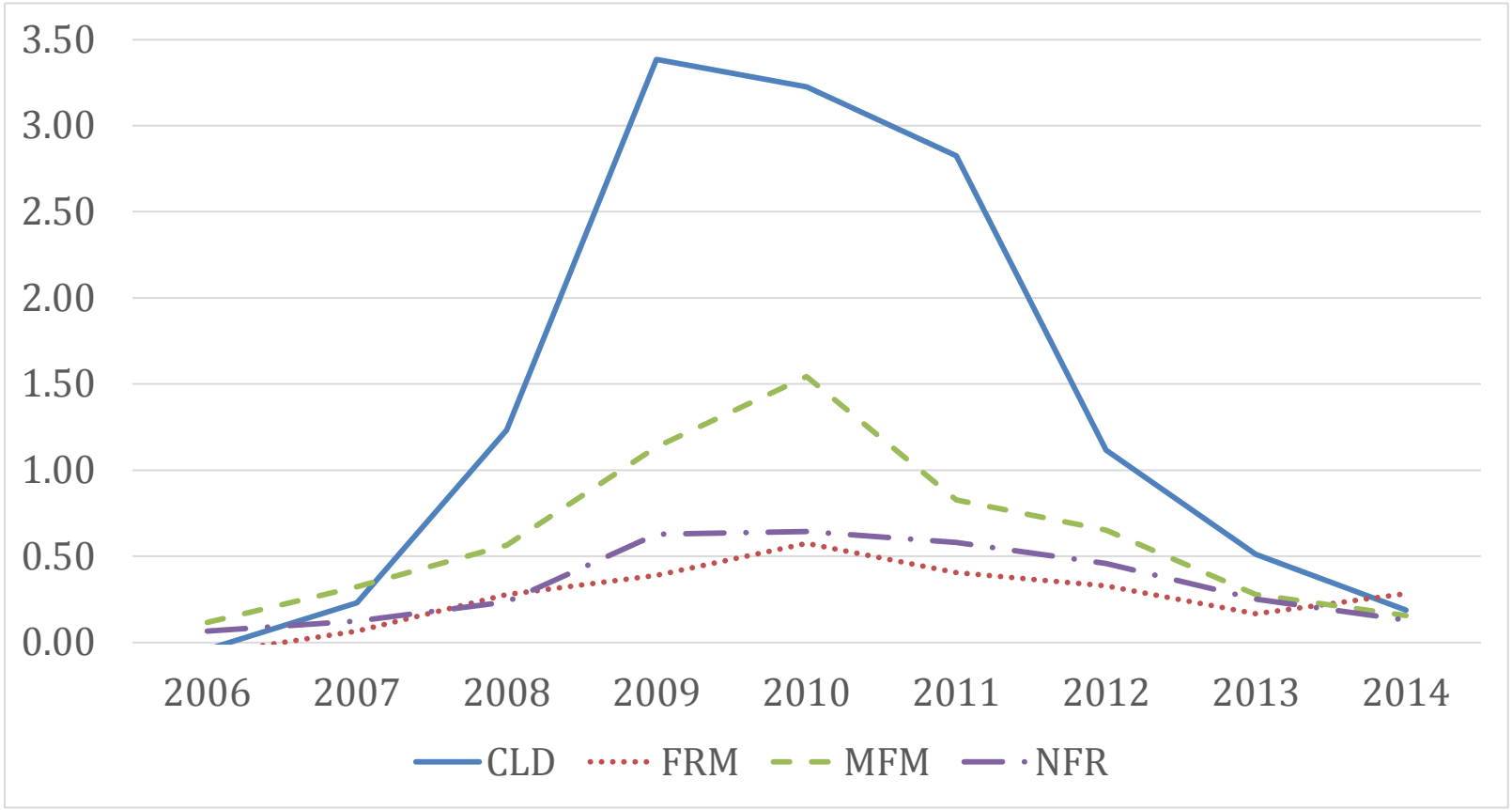
Why is a stress test needed?

- Stress tests
  - have been successfully implemented at the large banking organizations
  - are required already by community bank regulators to measure CRE concentration risk and interest rate risk
  - provide more credible benchmarks for required capital

CRE concentration at community banks rose substantially and remains high



CLD mean chargeoffs were especially high



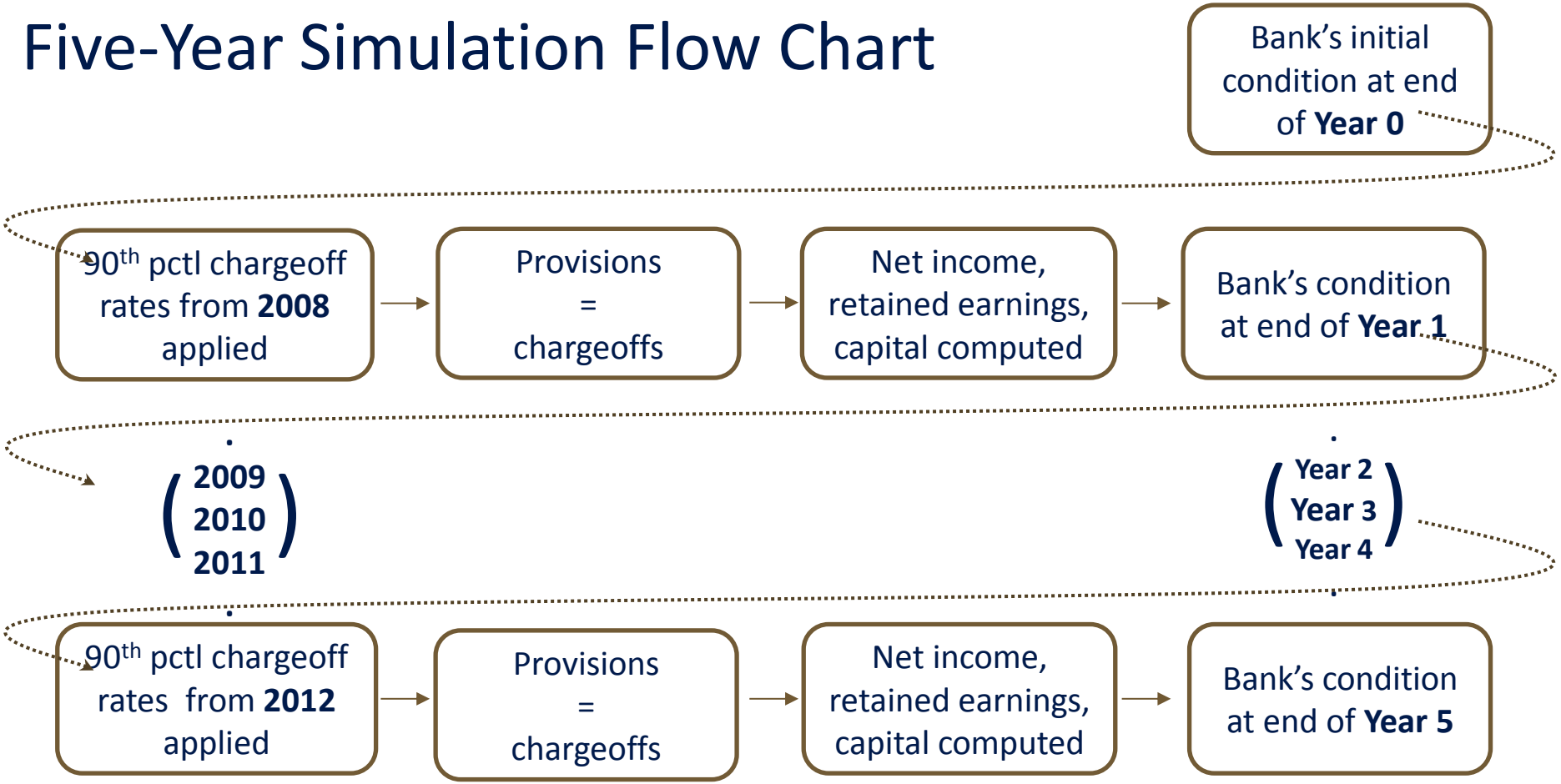
Key components of the stress test

- Each community bank is
  - grouped with other community banks by the relevant geography (MSA or state)
  - subjected to a 5-year simulation where (net) chargeoff rates for each group and loan type are drawn from the 90th percentile chargeoffs rates each year between 2008 and 2012
    - imposes a rigid backward-looking bias

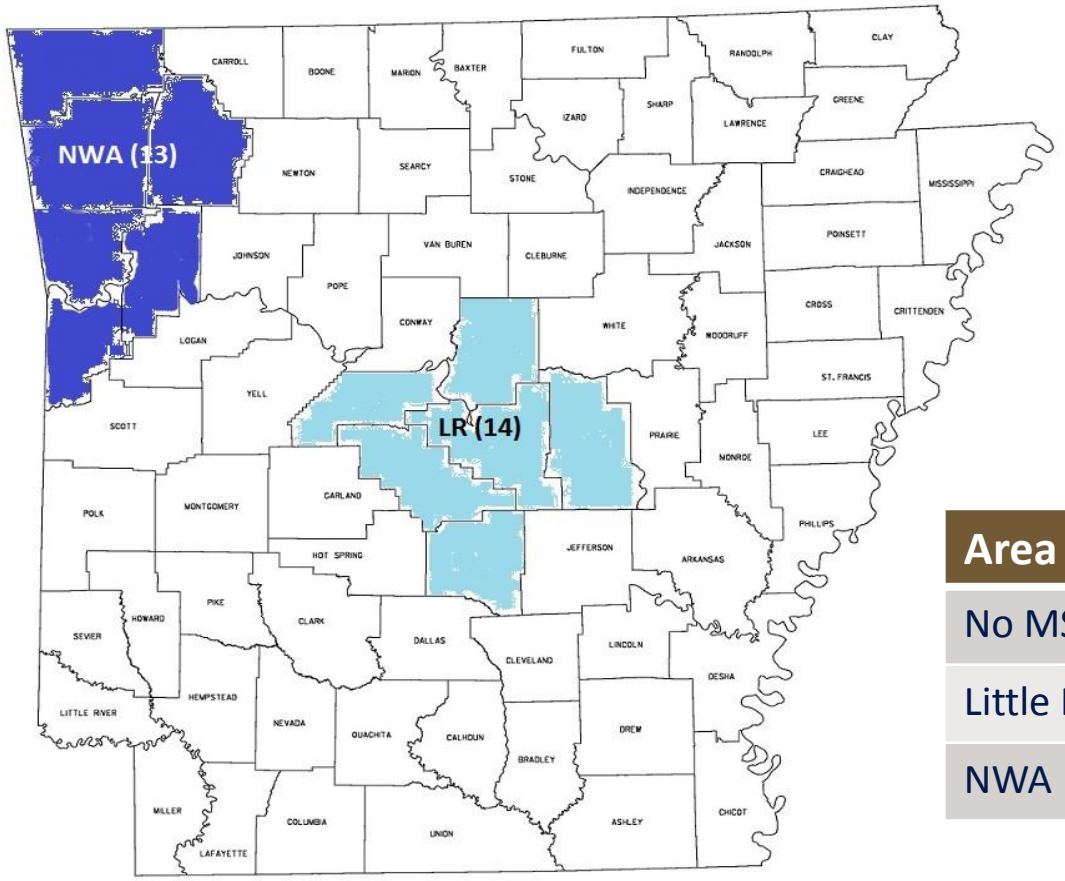
Key assumptions of the stress test

- Each community bank
  - maintains the initial asset composition except that charged off loans are not replaced
  - set provision expense equal net chargeoffs each year
  - pays dividends equal to its initial dividend to net income ratio if net income is positive, and $0 if the bank suffers losses

Five-Year Simulation Flow Chart



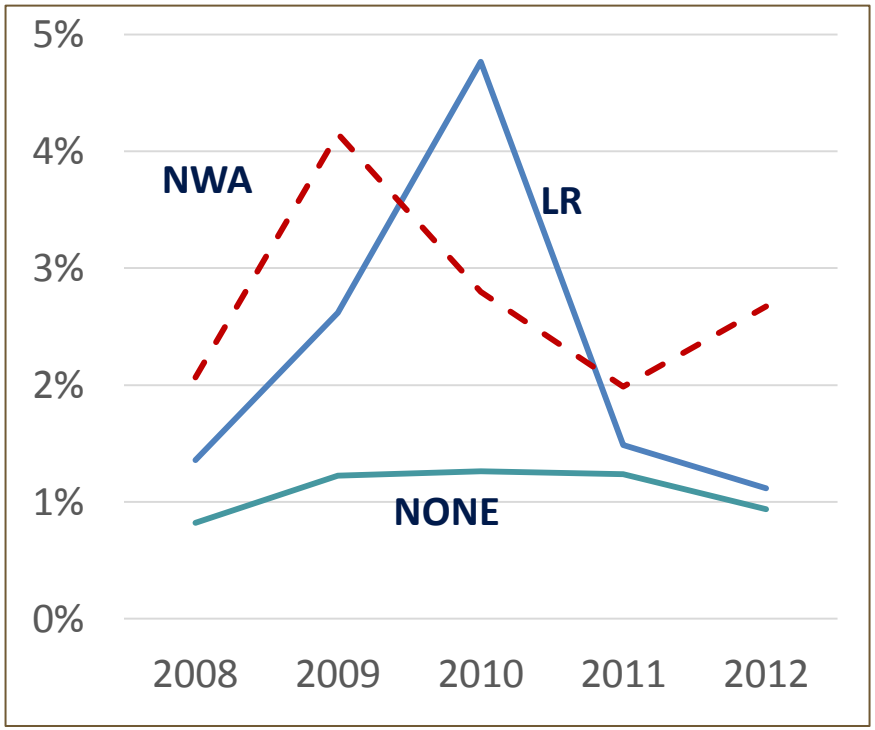
Stress test applied to Arkansas community banks



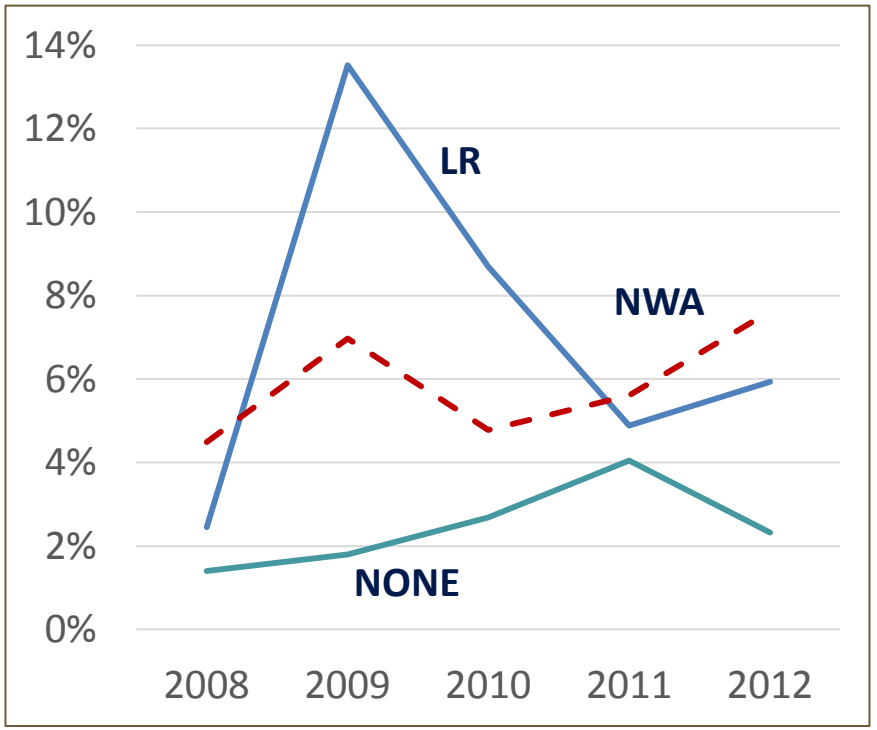
Area	Number
No MSA	78
Little Rock	14
NWA	13

Chargeoff rates

All Loans



CLD Loans



Stress Test Results

Beginning Year = 2014

(N=105)

Equity to Assets	Year 0 2014	Year 1 2015	Year 2 2016	Year 3 2017	Year 4 2018	Year 5 2019
Mean	11.9%	11.8%	11.6%	11.3%	11.1 %	10.9%
Median	11.0%	11.0%	10.9%	10.8%	10.6%	10.6%
No. < 2%	0	0	1	2	2	**3**
No. < 6%	1	2	2	3	6	**9**

Chargeoffs to Loans	2014	2015	2016	2017	2018	2019
Mean	0.24%	1.25%	2.05%	2.32%	1.74%	1.42%
Actual Percentile		91%	91%	90%	94%	92%

Stress Test Results

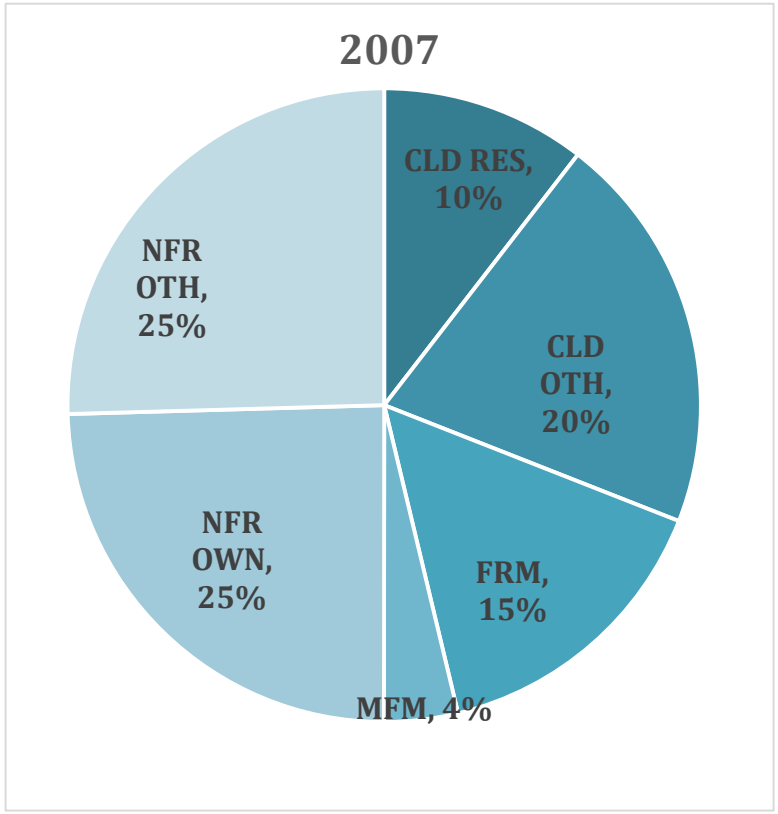
Beginning Year = 2007

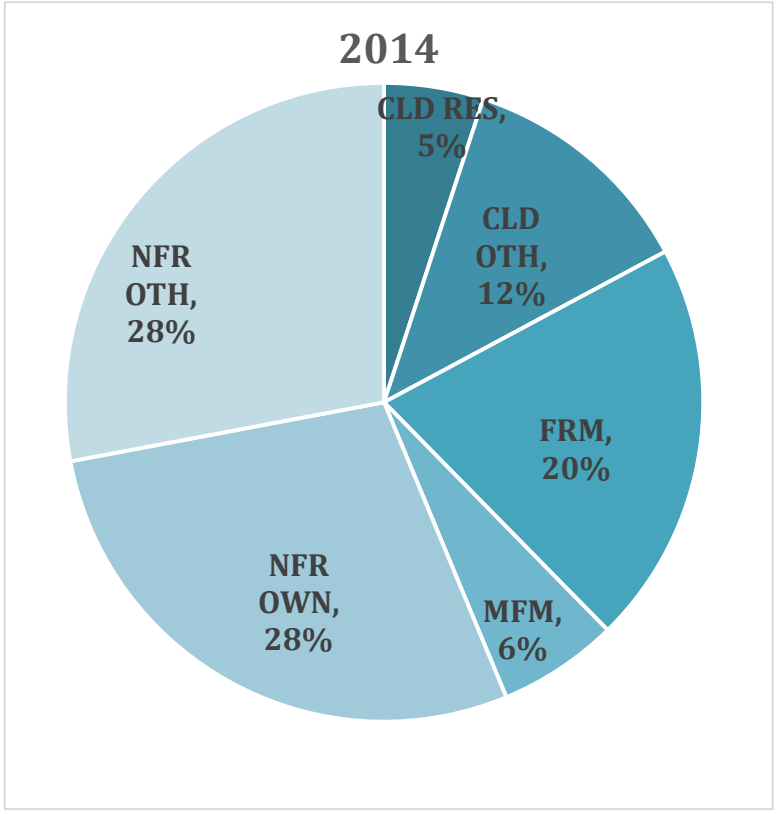
(N=143)

Equity to Assets	Year 0 2007	Year 1 2008	Year 2 2009	Year 3 2010	Year 4 2011	Year 5 2012
Mean	11.6%	11.5%	11.1%	10.7%	10.5%	10.4%
Median	10.8%	10.6%	10.2%	10.1%	10.0%	10.0%
No. < 2%	0	0	1	2	2	**4**
No. < 6%	1	1	3	13	20	**25**

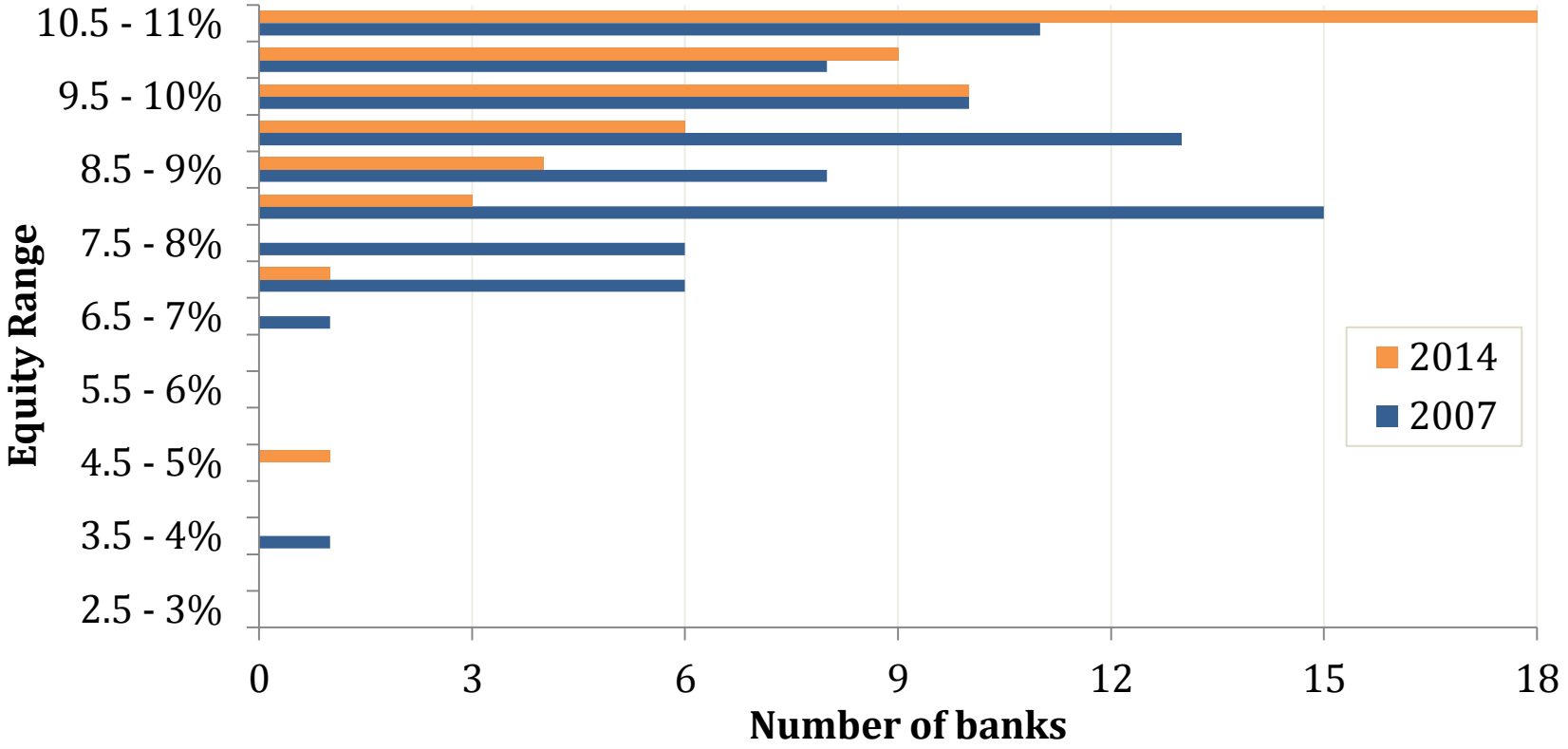
Chargeoffs to Loans	2007	2008	2009	2010	2011	2012
Mean	0.25%	1.49%	2.42%	2.48%	2.00%	1.65%

CRE loan portfolios are a bit different…





...and far fewer banks in 2014 have low equity ratios relative to 2007



In-Sample Model Performance

- Should be a strong correlation between weakest banks in 2007 and weakest stress test outcomes
  - banks that failed or issued equity under distress
  - banks with lowest 2007 equity ratios
  - banks with highest failure probability in 2007

Equity issuers 2008-2012

- One Arkansas bank failed from credit risk and at least 13 issued equity under distress
  - The model predicted the failure, and it correctly identified 11 of the 13 as having weak equity ratios.

Correlations with equity ratios and failure probability, and CRE concentration

Spearman Rank Correlations of Early Warning Signals and Stress Test Outcomes

Variable rank	Year 5 projected equity rank (2012)	Variable rank	Year 5 projected equity rank (2019)
Equity ratio, 2007	0.76	Equity ratio, 2014	0.73
DFP, 2007	0.65	DFP, 2014	0.58
CRE/TA, 2007	0.20	CRE/TA, 2014	-0.04

Take-aways

- A community bank stress test can add value to banks and supervisors.
- An historical loss approach provides a realistic worst-case forecast at a high confidence level.
- In-sample testing shows a high correlation between model outcomes and actual bank performance.
- The loss rates in the model are rigidly backward looking, but they can be easily modified if desired.