



FEDERAL RESERVE BANK *of* NEW YORK

U.S. Supervisory Stress Testing

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Disclaimer

The views expressed in this presentation are my own and do not necessarily represent the views of the Federal Reserve Bank of New York or the Federal Reserve System.



Why stress tests?

Background: Bank Capital

- Today I'll be talking about stress tests of bank capital adequacy.
- In banking, “capital” refers to common and preferred equity and (sometimes) long-term subordinated debt
 - Why is equity capital important? Answer: aligns incentives; provides a buffer against insolvency; reduces run risk etc.
- U.S. banking organizations are subject to regulatory capital minimums based on accounting data and expressed as ratios of capital relative to:
 - Total assets (“leverage ratios”)
 - Risk-weighted assets, which give higher/lower weights to more/less risky assets (“risk-based ratios”)



Stylized Bank Balance Sheet

ASSETS		LIABILITIES	
CASH	10	DEPOSITS	70
LOANS	60	SHORT-TERM DEBT	10
SECURITIES	20	LONG-TERM DEBT	10
OTHER ASSETS	10	EQUITY	10

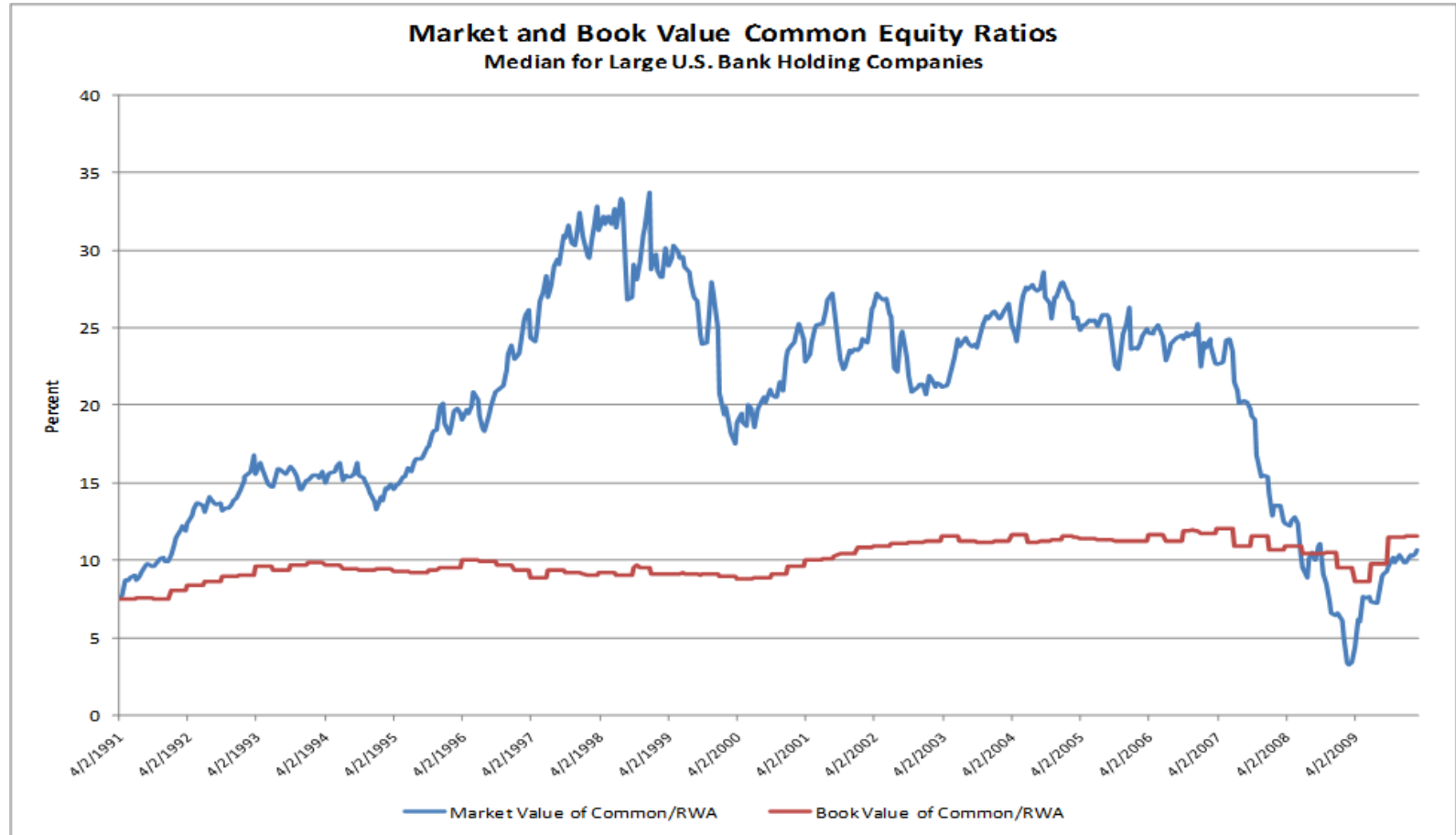
Regulatory Capital

Lessons from the 2008 Financial Crisis

- In a crisis, lots of uncertainty about extent of losses at individual banks and in the banking system as a whole
- Regulatory capital ratios are slow-moving, backward looking
 - Slow to adjust to changing fundamentals (e.g., Lehman Brothers had Tier 1 capital ratio of 11.6 percent just before it failed.)
 - Subject to window-dressing and manipulation (e.g., Repo 105).
 - Don't reflect downside risk.
- Common equity is what matters
 - Best buffer against losses; adjusts automatically as asset values change.
 - Other forms of “capital” were significantly discounted by the market.
 - Regulatory capital ratios didn't focus on common equity – no regulatory capital ratio based on common equity alone.

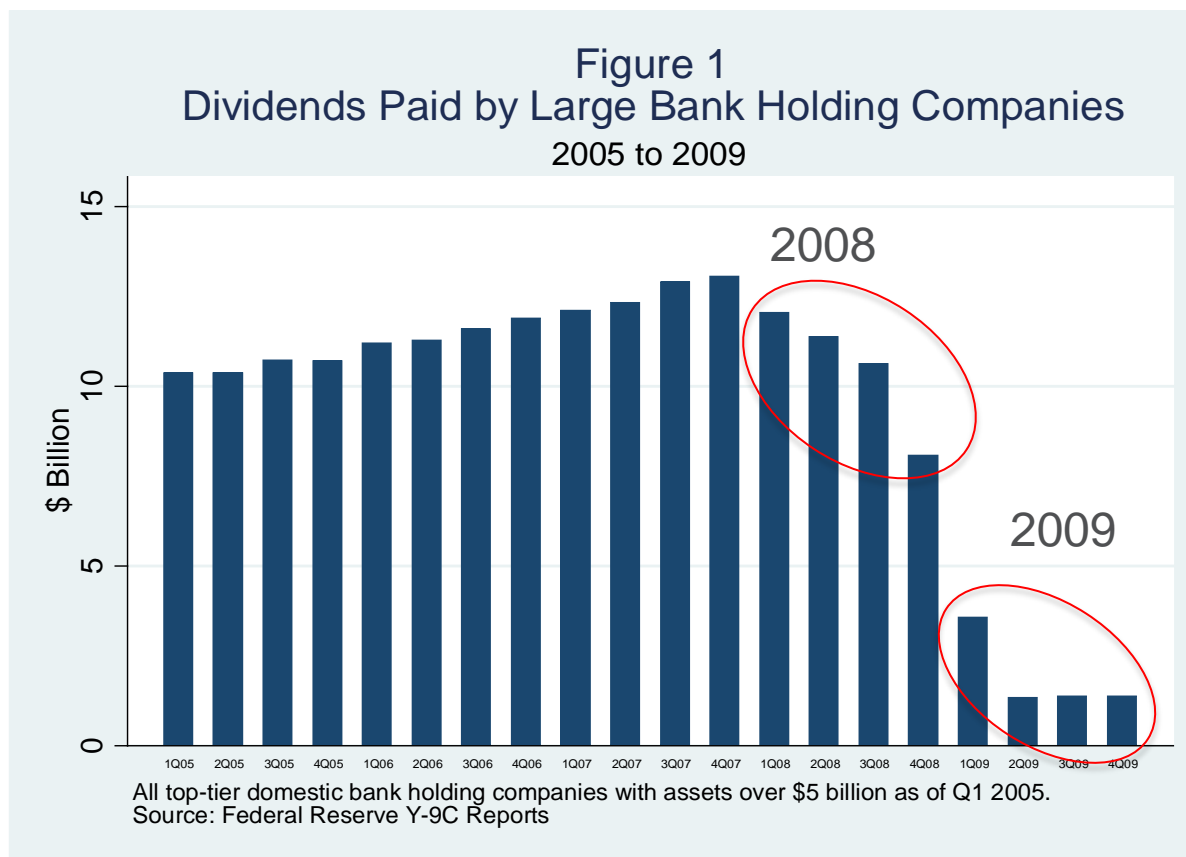


Market and Book Values of Common Equity



Bank dividends during the crisis

- Most did not reduce dividends until relatively late in the crisis



- Lesson: Can't necessarily rely on banks themselves to conserve capital ahead of times of stress.



Why stress tests?

- Projects what *might* happen to a bank's capital if the economy declines. Hypothetical exercise based on particular macro scenario.

Key features:

- A way to bring a forward-looking perspective to assessing whether a bank has sufficient capital *today*.
- Provides information not just about individual banks, but about the banking system as a whole.
- Focus on downside risk. Not a panacea, but a kind of upper bound if the scenario and assumptions are severe enough.



What do U.S. bank stress tests do?

- Project what happens to income and regulatory capital under hypothetical stressed economic and financial market conditions
- Final outputs are regulatory capital ratios. Key “law of motion”:

$$\text{Capital}_t = \text{Capital}_{t-1} + \text{Net Income}_t - \text{Capital Distributions}_t$$

Here, capital distributions (dividends, repurchases etc.) either reflect stylized assumptions or capital plans submitted by the firms.

- Also need to project the denominator of the capital ratio (assets and/or risk-weighted assets).



History of U.S. Bank Supervisory Stress Testing

- **2009:** Supervisory Capital Assessment Program (SCAP)
 - performed during the height of the financial crisis
 - focus on 19 largest individual BHCs – 2/3 of the assets of the banking system
 - banks had to raise capital to meet any shortfall relative to target
 - **published individual BHC results – a big innovation**
 - **banks raised \$100 billion in new common equity following the SCAP**
- **2011 on:** Comprehensive Capital Analysis and Review (CCAR)
 - supervisory assessment of capital adequacy; initially 19 largest BHCs, now 31
 - both BHC-run and supervisory stress test projections are inputs
 - disclosure of supervisory results starting in 2012
- **2013 on:** Dodd-Frank Act Stress Tests (DFAST)
 - requires BHC-run and supervisory stress test projections; initially 18 largest BHCs, now 31 large BHCs
 - disclosure of supervisory and BHC results starting in 2013



**Comprehensive Capital Analysis and
Review (CCAR) and Dodd-Frank Act Stress
Tests (DFAST)**

What is the CCAR?

- Annual forward-looking assessment of large, complex bank holding company (BHC) capital adequacy processes
 - All U.S. BHCs with assets > \$50 billion (31 firms in CCAR 2015)
- Key questions considered in the CCAR:
 - How does a BHC determine how much capital it needs?
 - Are the processes used by the BHC to make this determination thorough and robust?
 - Is the capital held by the firm adequate?
- Stress tests are an important part of the CCAR, but not the only part.
 - Involves both company-run and Fed-run stress tests



How does it work?

- BHCs submit capital plans to the Federal Reserve:
 - Description of BHC's capital policy and process for assessing capital adequacy
 - Planned capital actions (dividends, share repurchases, issuance)
 - Projections of capital over 9-quarter forward horizon under expected and stressed economic conditions
- The Federal Reserve evaluates all elements of these capital plans
 - Part of this evaluation: independent Fed-run stress tests
 - Firms must remain adequately capitalized under both their own company-run tests *and* the Fed's independent stress tests.



Results of the CCAR

- The Federal Reserve either “objects” or “does not object” to each BHC’s capital plan
 - Fed could object because stressed capital ratios fall below regulatory minimums, and/or for other reasons
 - **If the Federal Reserve objects, BHCs may make only those capital distributions (dividends, repurchases) explicitly not objected to by the Federal Reserve**
- Objection or non objection decision is publicly disclosed (with brief reasoning why) along with projected minimum stress capital ratios.
- BHCs are required to re-submit capital plans if the Fed objects to the plan or if the BHC experiences a material change in risk exposure
- Typically many supervisory issues generated in the CCAR, even for those banks whose plans are not objected to

CCAR versus DFAST stress tests

- Also conducted on same cycle: stress tests mandated under the Dodd-Frank Wall Street Reform and Consumer Protection Act.
 - Fed-run stress tests under three Fed-mandated scenarios (“baseline”, “adverse” and “severely adverse”). Stress results are publicly disclosed.
 - Company-run stress tests under the same three Fed scenarios
 - Broader set of firms (>\$10bn assets). Firm must disclose sev. adv. results.
 - Company-run stress tests under three scenarios defined by the firm
- DFAST and CCAR supervisory stress tests closely related, but distinct
 - Same set of scenarios and projections of net income
 - Different capital actions (e.g., dividends, share repurchases, issuance) assumed in calculating capital ratios
 - DFAST: stylized assumptions mandated in the regulation
 - CCAR: capital actions in BHCs’ capital plans under baseline scenario



How Does the Federal Reserve Conduct Stress Tests?

Overview of Process

Key inputs:

- Hypothetical macroeconomic scenarios
- Detailed data collected from the BHCs
- Models that project net income and capital

Basic idea (crude approximation):

1. Plug macroeconomic scenarios and BHC data into the models, and generate projections of revenue and losses.
2. Add up the results to obtain projections of net income and ultimately capital.



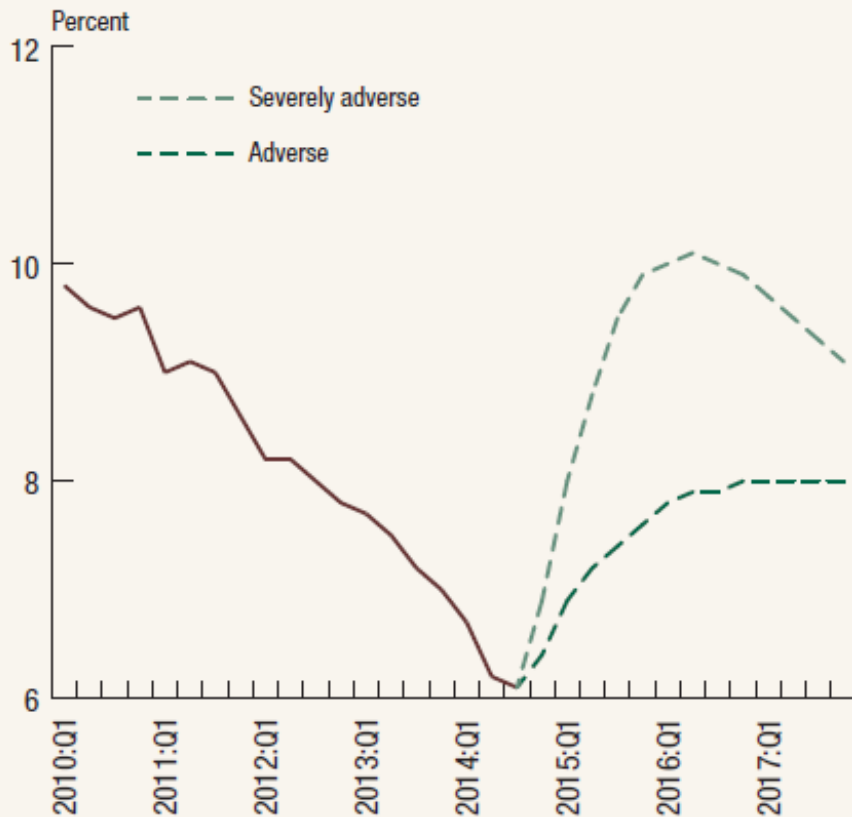
Scenario development

- Federal Reserve develops three economic and financial scenarios
 - Baseline, Adverse, Severely Adverse
 - Scenarios made public in November of each year
- Severely Adverse scenario in 2015:
 - A deep recession and sharp fall in asset prices
 - Sharp rise in credit spreads + financial market volatility
 - Trading positions at largest BHCs also subject to global market shock (big moves in spreads, rates, prices)
 - Default of largest counterparty at 8 large BHCs, after global market shock
- Adverse scenario for 2015:
 - Milder recession and milder financial market shocks
 - But a rise in rise in interest rates along the yield curve
- Nine-quarter horizon. For CCAR 2015, ran from Q4 2014 to Q4 2016.



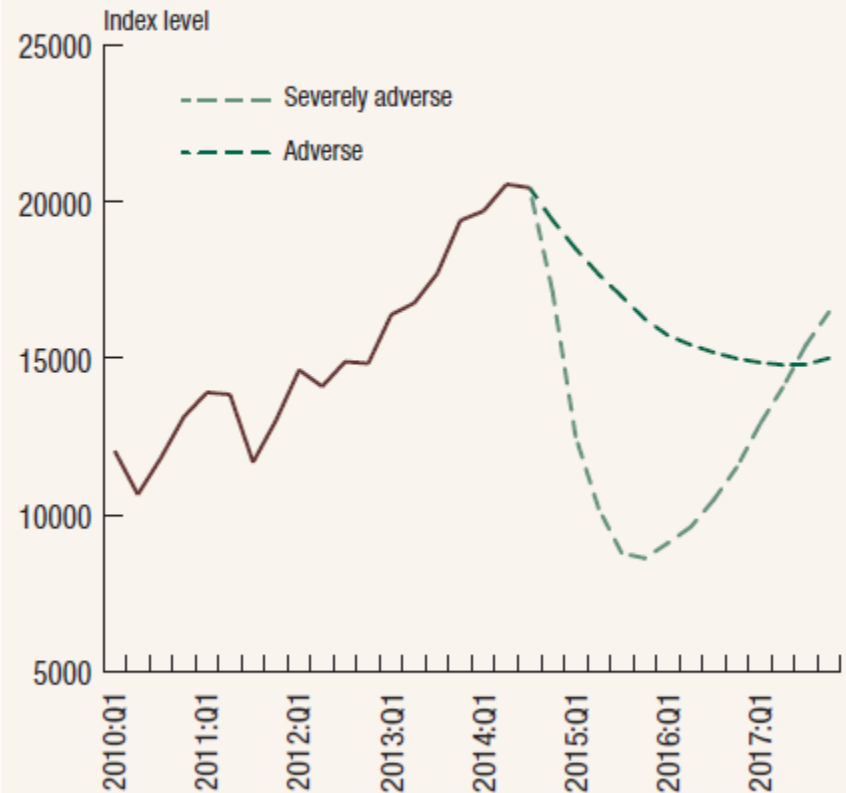
Stress Scenarios for Unemployment and Stock Prices

Figure 2. Unemployment rate in the severely adverse and adverse scenarios, 2010:Q1–2016:Q4



Source: Bureau of Labor Statistics and Federal Reserve assumptions in the supervisory scenarios.

Figure 4. Dow Jones Total Stock Market Index, end of quarter in the severely adverse and adverse scenarios, 2010:Q1–2016:Q4



Source: Dow Jones and Federal Reserve assumptions in the supervisory scenarios.

For more details of scenario design:

<http://www.federalreserve.gov/newsevents/press/bcreg/bcreg20141023a1.pdf>



Data Collection from the BHCs

- To generate accurate and comprehensive stress test results, need information about each BHC's assets, liabilities, income and expenses
- BHCs provide extensive data on their loan, securities, and trading portfolios; business activities; revenue and expenses; and balance sheet on regulatory reports
 - FR 14-M, FR 14-Q and FR 14-A regulatory reports
- Firm-specific risk attributes, loss protection/mitigation, revenue and expense drivers, portfolio composition
- Millions of data elements per BHC

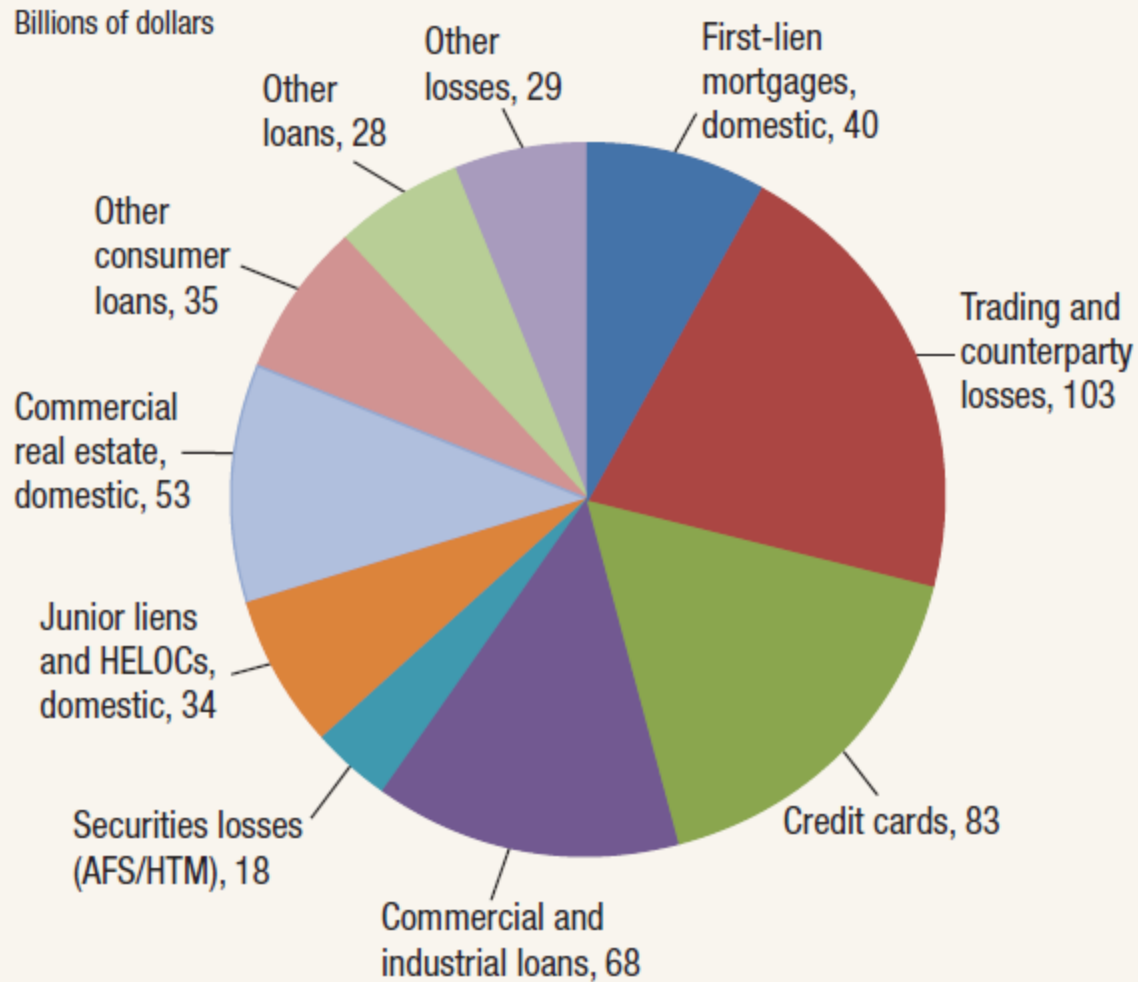
Models and Output

- The Federal Reserve uses a suite of models to project revenues, losses, the balance sheet, risk-weighted assets, and capital
 - Detailed models often at level of individual loan or security.
 - With few exceptions, independent estimates, not adjustments to bank projections.
- Federal Reserve models capture “typical” BHC behavior
 - Models calibrated using industry-wide data
 - No firm-specific adjustments, just firm-specific input data
 - Limited use of “fixed effects”
 - Consistent assumptions across BHCs
- Key objective is consistency across BHCs
 - Differences in results across firms reflect variation in input data (e.g., differences in types of loans held).



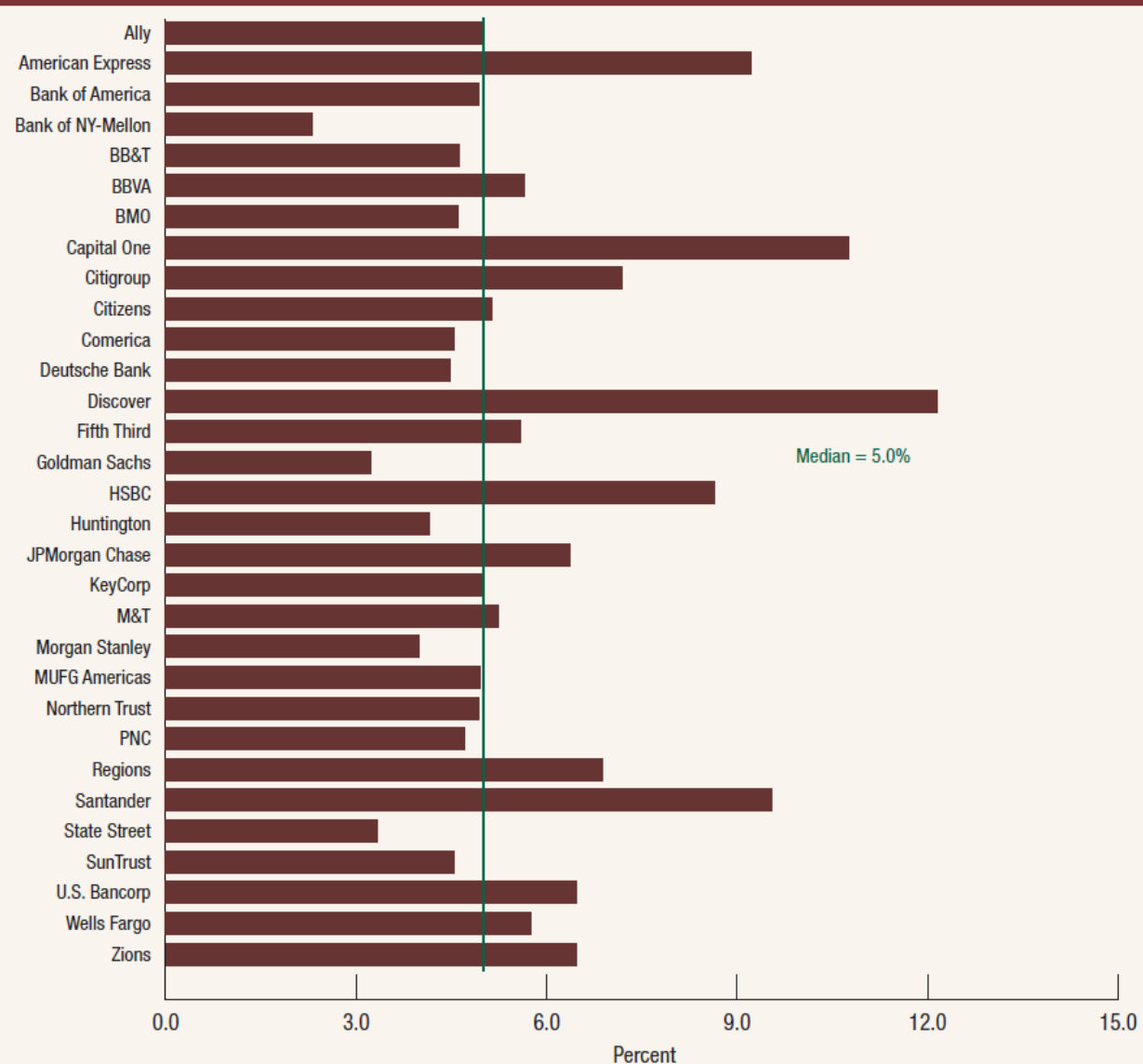
Sources of Losses – Severely Adverse Scenario

Figure 9. Projected losses in the severely adverse scenario



Loan Loss Rate by Firm – Severely Adverse

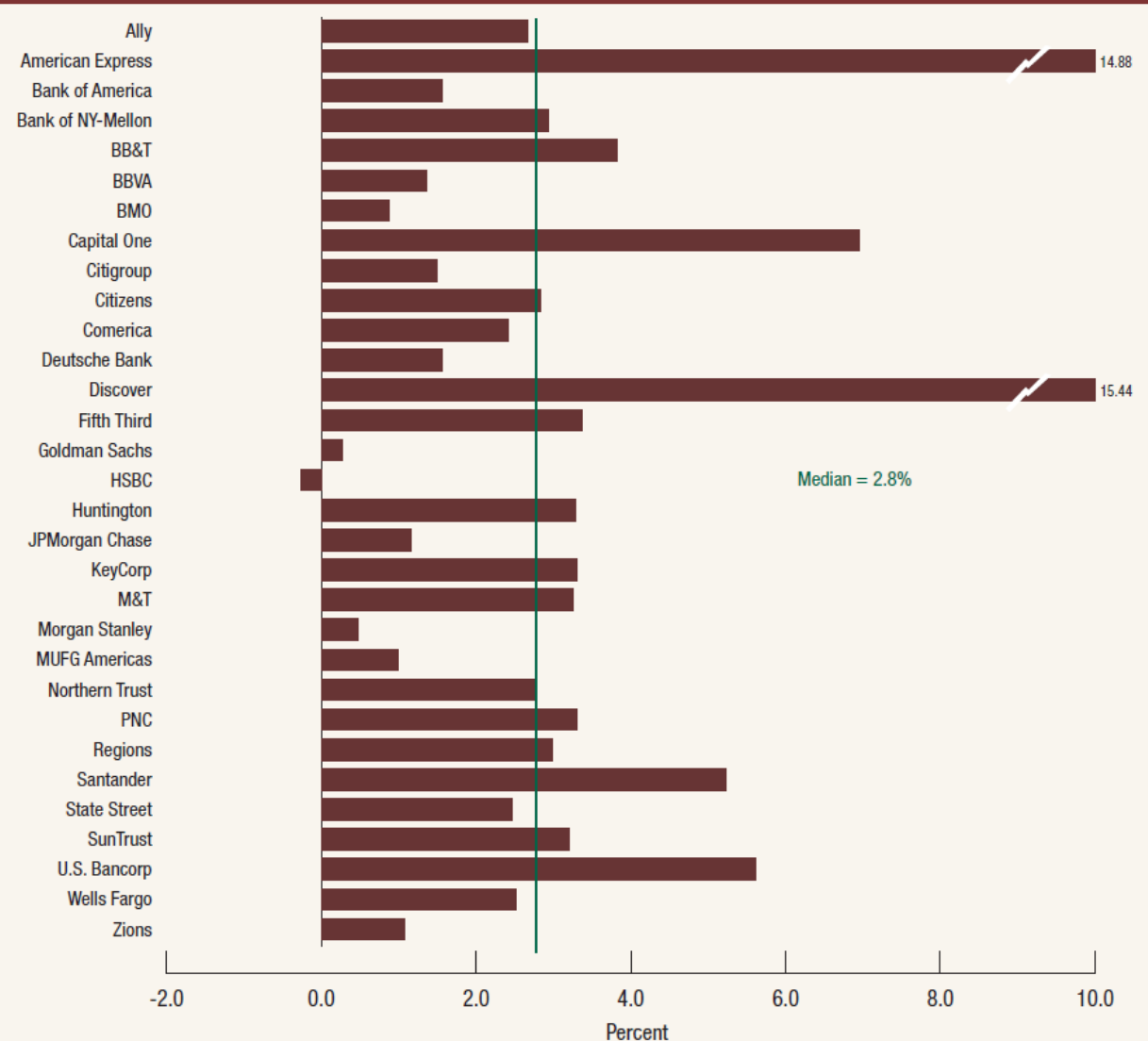
Figure 11. Total loan loss rates in the severely adverse scenario



Note: Estimates are for nine quarter period from 2014:Q4–2016:Q4 as a percent of average balances.

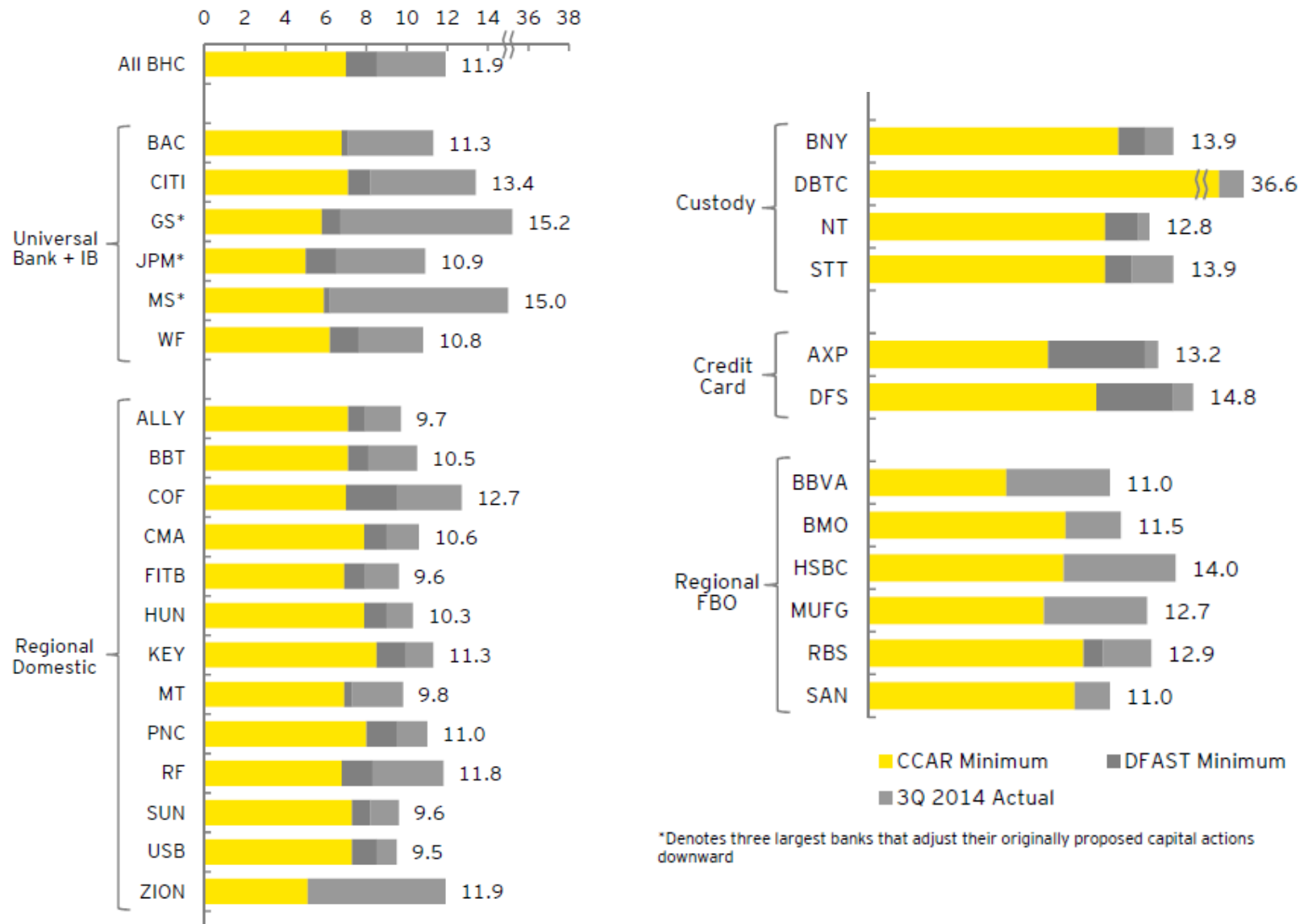
Pre-provision net revenue by firm – Severely Adverse

Figure 12. PPNR rates in the severely adverse scenario



Note: Estimates are for the nine-quarter period from 2014:Q4–2016:Q4 as a percent of average assets.

CCAR and DFAST minimum capital ratios: 2015 stress tests



*Denotes three largest banks that adjust their originally proposed capital actions downward

Closing thoughts

- The Federal Reserve's stress testing program represents a significant break from the "traditional" approach to bank supervision, e.g.,:
 - Quantitative, model-based methodology
 - Much more detailed data collection from firms
 - Based on explicit "worst case" scenarios
 - Horizontal test across many firms
 - Much greater disclosure of results
- Represents part of an overall trend towards greater use of supervisory stress testing around the globe



More on CCAR, DFAST and SCAP

- DFAST 2015 stress test results: <http://www.federalreserve.gov/newsevents/press/bcreg/bcreg20150305a1.pdf>
- CCAR 2015 results: <http://www.federalreserve.gov/newsevents/press/bcreg/bcreg20150305a1.pdf>
- DFAST 2014 stress test results: <http://www.federalreserve.gov/newsevents/press/bcreg/bcreg20140320a1.pdf>
- CCAR 2014 results: http://www.federalreserve.gov/newsevents/press/bcreg/ccar_20140326.pdf
- DFAST 2013 stress test results:
http://www.federalreserve.gov/newsevents/press/bcreg/dfast_2013_results_20130314.pdf
- CCAR 2013 results: <http://www.federalreserve.gov/bankinfo/ccar-2013-results-20130314.pdf>
- CCAR 2012 results: <http://www.federalreserve.gov/newsevents/press/bcreg/ccar-2013-results-20130314.pdf>
- Overview of CCAR 2011: <http://www.federalreserve.gov/newsevents/press/bcreg/bcreg20110318a1.pdf>
- SCAP Methodology (2009): <http://www.federalreserve.gov/newsevents/press/bcreg/bcreg20090424a1.pdf>
- SCAP Results (2009): <http://www.federalreserve.gov/newsevents/press/bcreg/bcreg20090507a1.pdf>