Overview of Independent Supervisory Stress Testing in the United States

Andreas Lehnert

Office of Financial Stability

Federal Reserve Board

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Any views expressed here are my own and do not necessarily reflect the views of the Board of Governors or the staff of the Federal Reserve System.

Pre-crisis: U.S. stress tests for financial risk management

Examples of U.S pre-crisis stress-tests:

1. In the 1980s, used by ratings agencies to assess firms with concentrated exposure to mortgages: thrifts and mortgage insurance companies

2. In the 1990s, encouraged by Basel II, *ad hoc* use by supervisory authorities

3. Between 1992 and 2008, basis of revised regulatory framework for Fannie Mae and Freddie – *only* risk-based capital measure for these firms was a stress test

4. In the 2000s, used by rating agencies to set subordination levels in asset backed securities holding residential mortgages

Thrifts, large bank risk management, Fannie/Freddie, rating agencies …

- … is this a legacy of success that should be emulated?

Post-crisis: The U.S. stress-testing program

U.S. stress testing program has evolved since SCAP into an annual exercise for the largest banking firms (> $50 billion in assets) with two components

1. Dodd-Frank Act Stress Tests (DFAST)
   - Purely quantitative
   - Mandated by law
   - Firms cannot "pass" or "fail"
   - Three scenarios: baseline, adverse, and severely adverse

2. Comprehensive Capital Analysis & Review (CCAR)
   - Quantitative and qualitative assessment of firm capital plans
   - Quantitative assessment of capital ratios in the severely adverse scenario if a firm makes its proposed dividend and share repurchases
   - Qualitative assessment of firms' risk management processes
   - The Fed publicly objects or not to firm capital plans

Post-crisis: The U.S. stress-testing program

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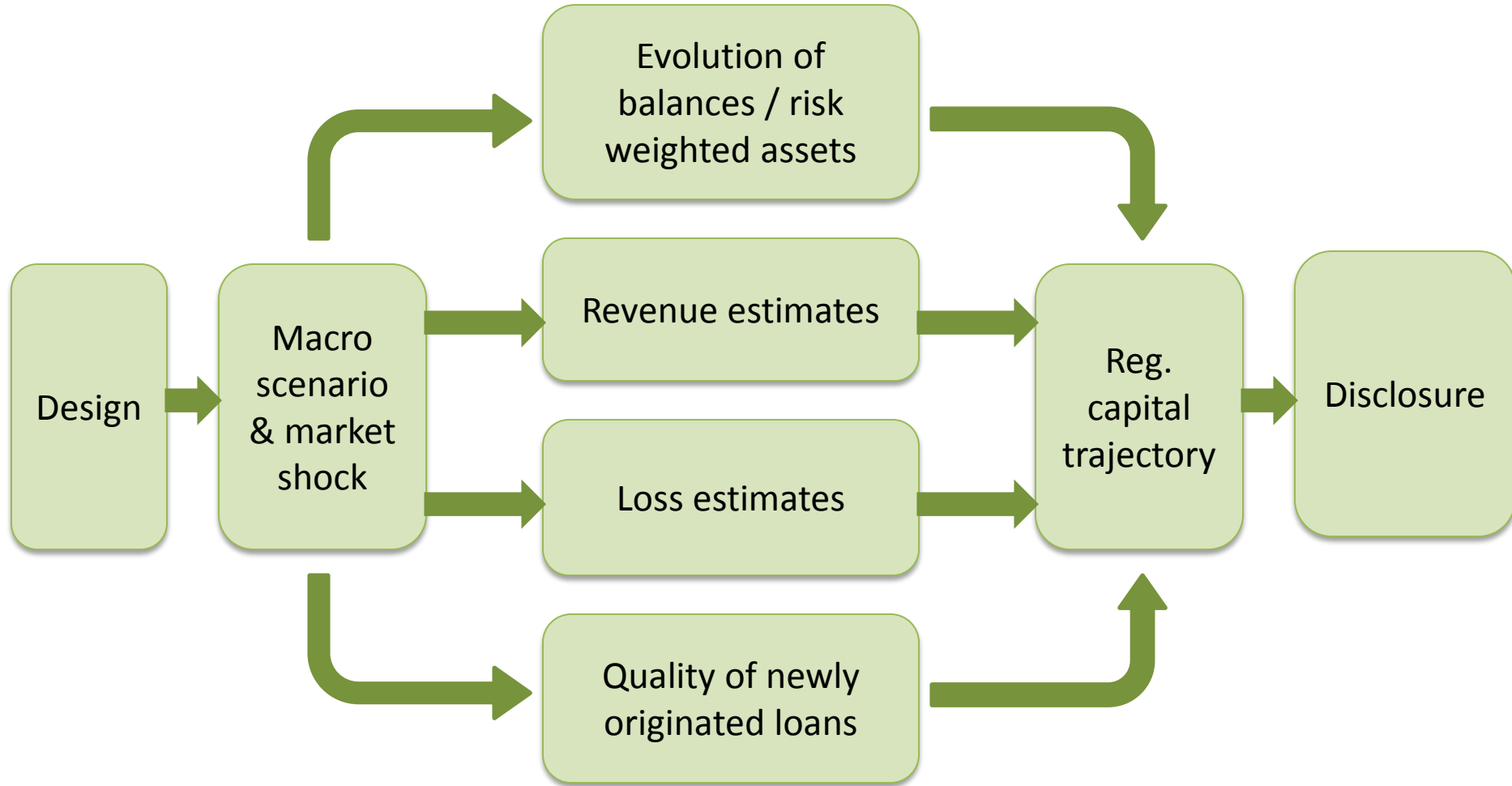   – Quantitative and qualitative assessment of firm capital plans
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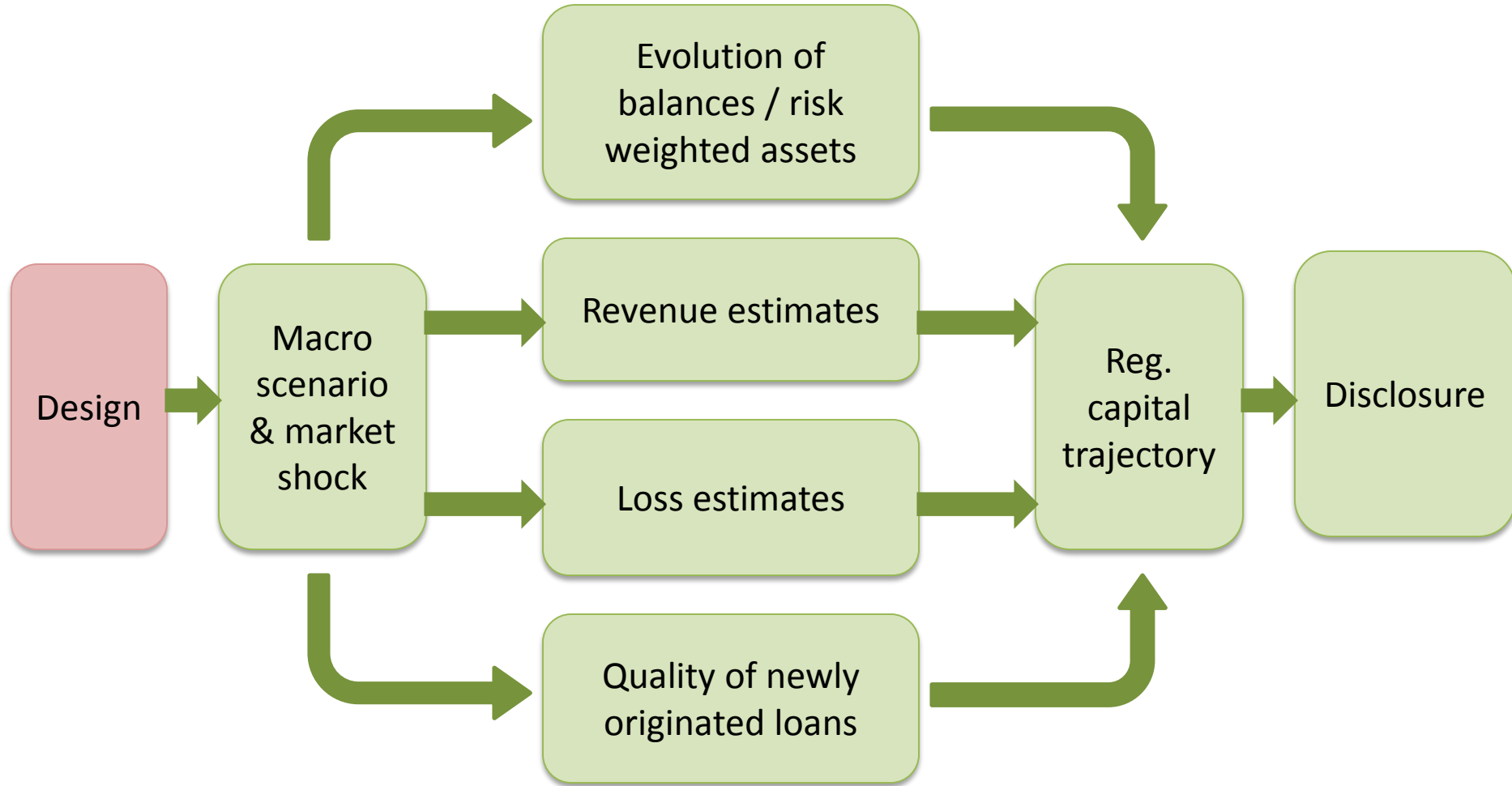   – Qualitative assessment of firms' risk management processes
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Steps in the quantitative assessment

# Steps in the quantitative assessment

- Design influences all steps of the quantitative assessment including scenario specification, model selection, capital policy, and disclosure decisions

Design choices for a supervisory stress test program

	Design issue	Some considerations
1	Scenarios	• Degree of severity? • Countercyclical?
2	Models	• Fully independent or use firm projections? • If independent, what underlying principles or philosophy of models?
3	Balance sheets	• Assume/permit shrink-to-health? • If not, what assumptions?
4	Capital policy	• What is the plan if a firm fails? • Public capital available?
5	Disclosure	• What to disclose about the supervisory stress tests? • What related information – e.g., firm results and supervisors' qualitative results – to disclose?

Steps in the quantitative assessment
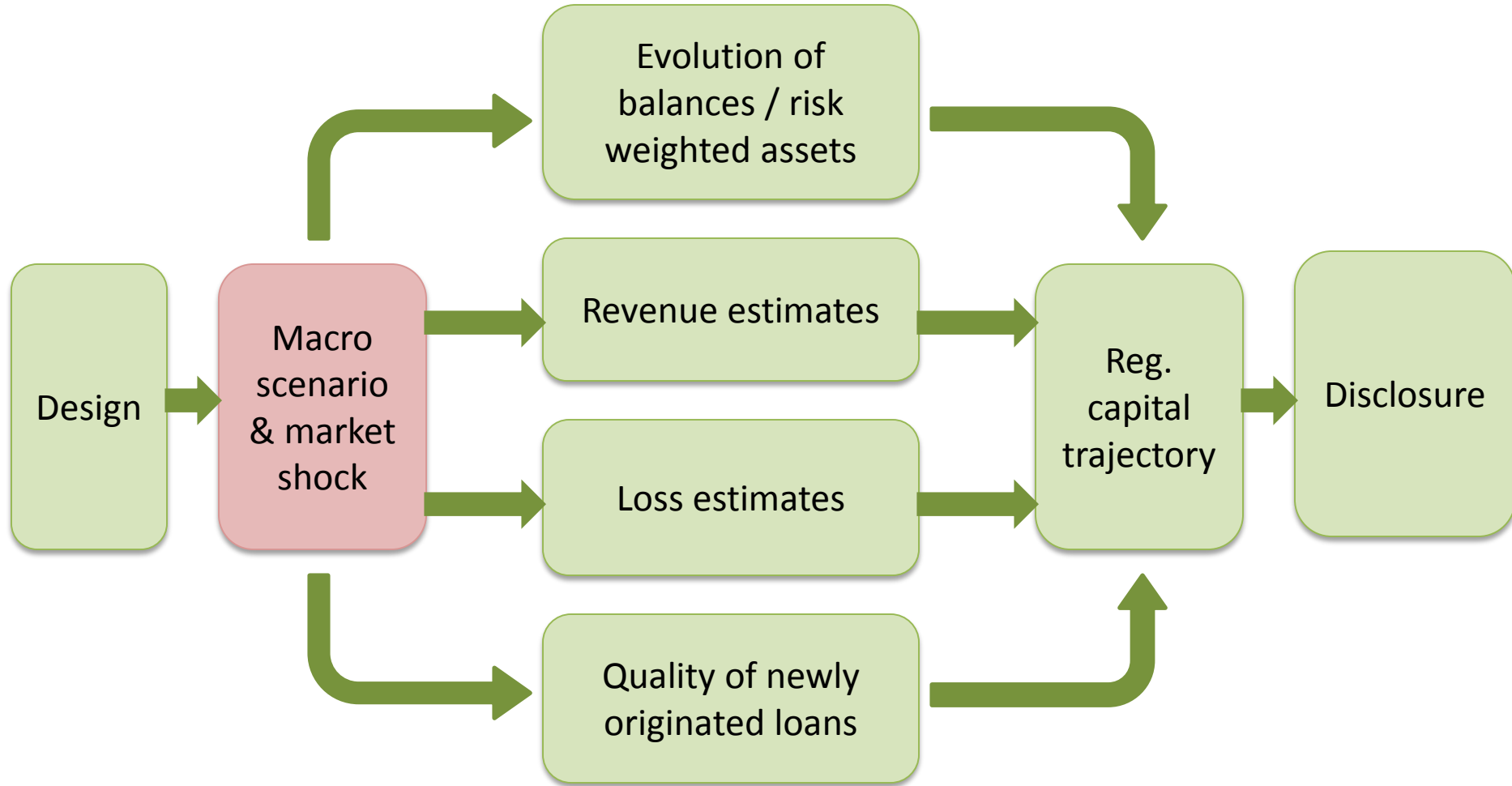
- Scenario design decisions: Specification method; severity; salient risks

Macro (stress) scenario specification methods

- **The "probabilistic" approach:** Uses a tail outcome associated with the baseline scenario. Implemented by:

  - Taking a density forecast around the baseline from a stochastic macro model (or subjective probability distribution)

  - Choosing a percentile for the stressed scenario

  - In practice, does not always generate a severe macro outcome

- **The "recession" approach:** Creates a scenario that features changes in key variables that are typical for recessions of some specified severity. Implemented by:

  - Characterizing the duration of past U.S. recessions and how key macro variables have evolved during these episodes

 - Choosing the type of recession to characterize the stressed scenario

Scenario severity based on historical U.S. recessions

| Peak	Trough	Severity	Duration (quarters)	Real GDP	Total Change in Unemp. Rate
1957Q3	1958Q2	Severe	4 (Medium)	-3.1	3.2
1960Q2	1961Q1	Moderate	4 (Medium)	-0.5	1.8
1969Q4	1970Q4	Moderate	5 (Medium)	-0.1	2.4
1973Q4	1975Q1	Severe	6 (Long)	-3.1	4.1
1980Q1	1980Q3	Moderate	3 (Short)	-2.2	1.4
1981Q3	1982Q4	Severe	6 (Long)	-2.6	3.3
1990Q3	1991Q1	Mild	3 (Short)	-1.3	1.9
2001Q1	2001Q4	Mild	4 (Medium)	0.7	2.0
2007Q4	2009Q2	Severe	7 (Long)	-4.7	5.1
Average		*Severe*	*6*	*-3.8*	*3.9*
Average		*Moderate*	*4*	*-1.0*	*1.8*
Average		*Mild*	*3*	*-0.3*	*1.9*

SCAP in 2009 to CCAR 2015
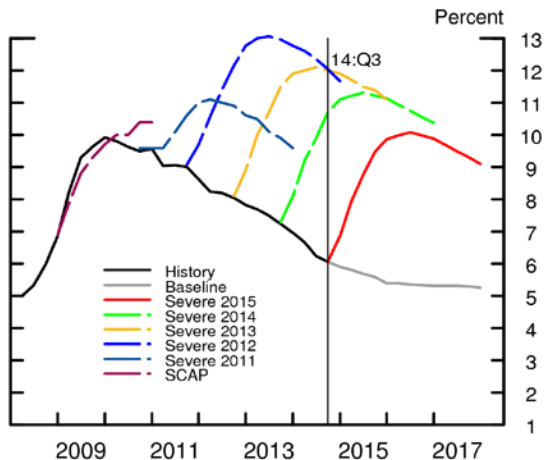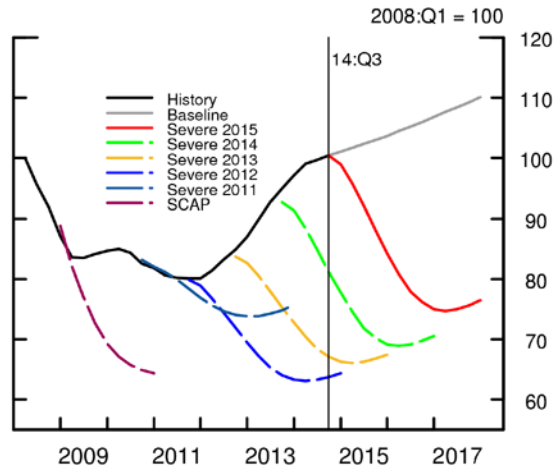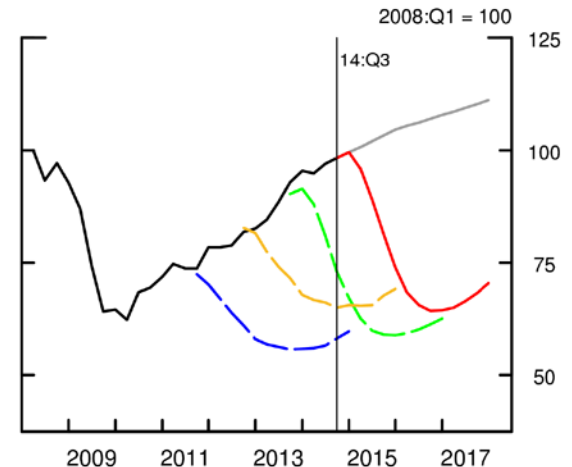
- Since CCAR 2012 the unemp. rate (UR) in the severely adverse scenario has been specified to increase to the max. of a 4 p.p. increase or to 10 percent
  - In "good times," when the UR is low, the increase in the UR in the scenario will be larger, so *somewhat* limiting procyclicality

- Scenarios includes features beyond those typical to recessions
  - Called "salient risks"
 - Example: Property prices, which do not typically fall in recessions

SCAP in 2009 to CCAR 2015, continued
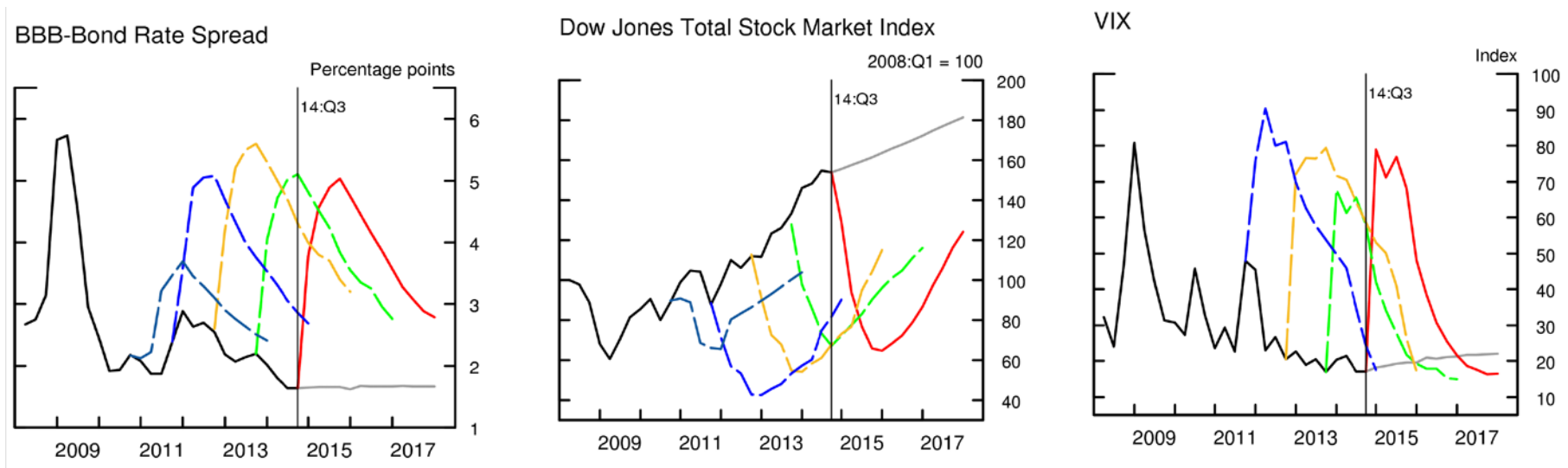
- A salient risks can also be included for one or few years
  - CCAR 2015 disproportionately stressed corporate credit markets

- Note: A total of 28 variables are included in the published scenarios and the Fed also publishes a narrative that describes developments for the paths of key variables not in the scenarios
  - CCAR 2015 narrative described spreads for many high-yield instruments

Remaining procyclicality
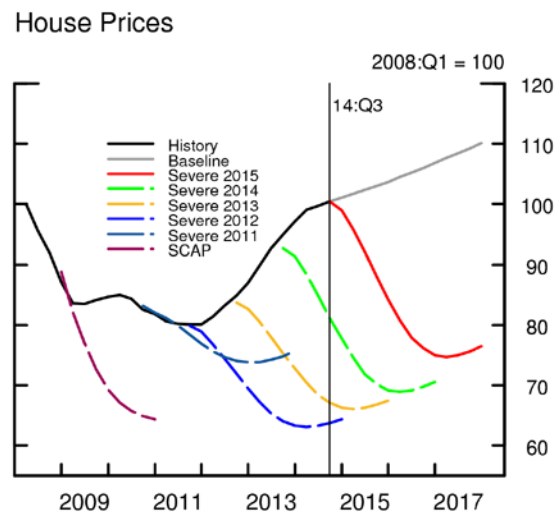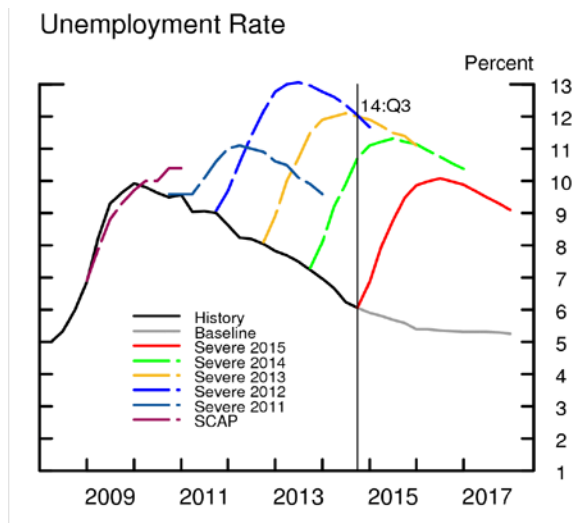
CCAR Cycle	2012	2013	2014	2015	Change (2012-2015)
Loan Losses (Portfolio loss Rate)	8.1	7.5	6.9	6.1	-25%
Decline in Net Income (% of Avg. Assets)	1.9	1.7	1.6	1.5	-21%

From: CCAR and Dodd-Frank Act Stress Test Results

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Steps in the quantitative assessment
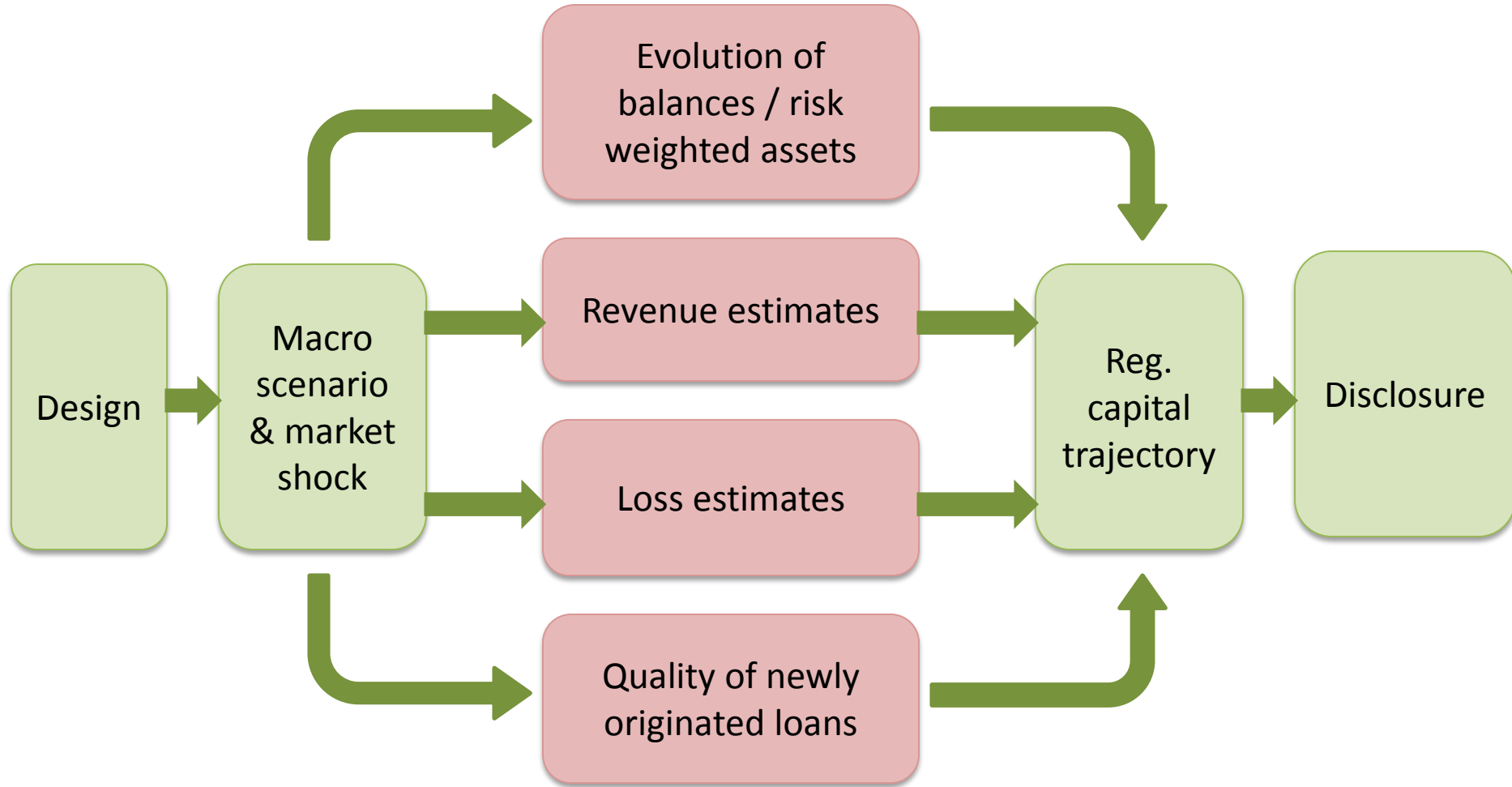
- Modeling decisions: Supervisory projections or firm projections that are then evaluated by supervisors; use of top-down or bottom-up models

Projecting net income and regulatory capital

Δ Reg. capital = Pre-provision Net Revenue (PPNR) + Other Revenue

– Provisions for loan and lease losses

– Realized losses/gains on AFS & HTM securities

– Trading and counterparty losses/gains – Other losses/gains

+ Other items, adjustments, etc. – Taxes

– Deductions & additions to reg. capital (*e.g.*, OCI)

– Net capital distributions to shareholders

- In SCAP, banks projected these variables

  – Supervisory projection models, estimated on aggregate data, provided "indicative loss ranges" to evaluate bank projections

- Over time more variables have been projected by supervisory models

  – Supervisory models permit greater comparability of results across banks

# Projecting net income and regulatory capital, contd.

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- The supervisory projection models …

  – For losses primarily use granular – i.e., loan- and securities-level – data

  ▪ Entails substantial data collection from firms and use of staff resources

  – For revenues and balance-sheet paths primarily use firm-level data

  ▪ Granular data is used for some revenue calculations

Components of net income
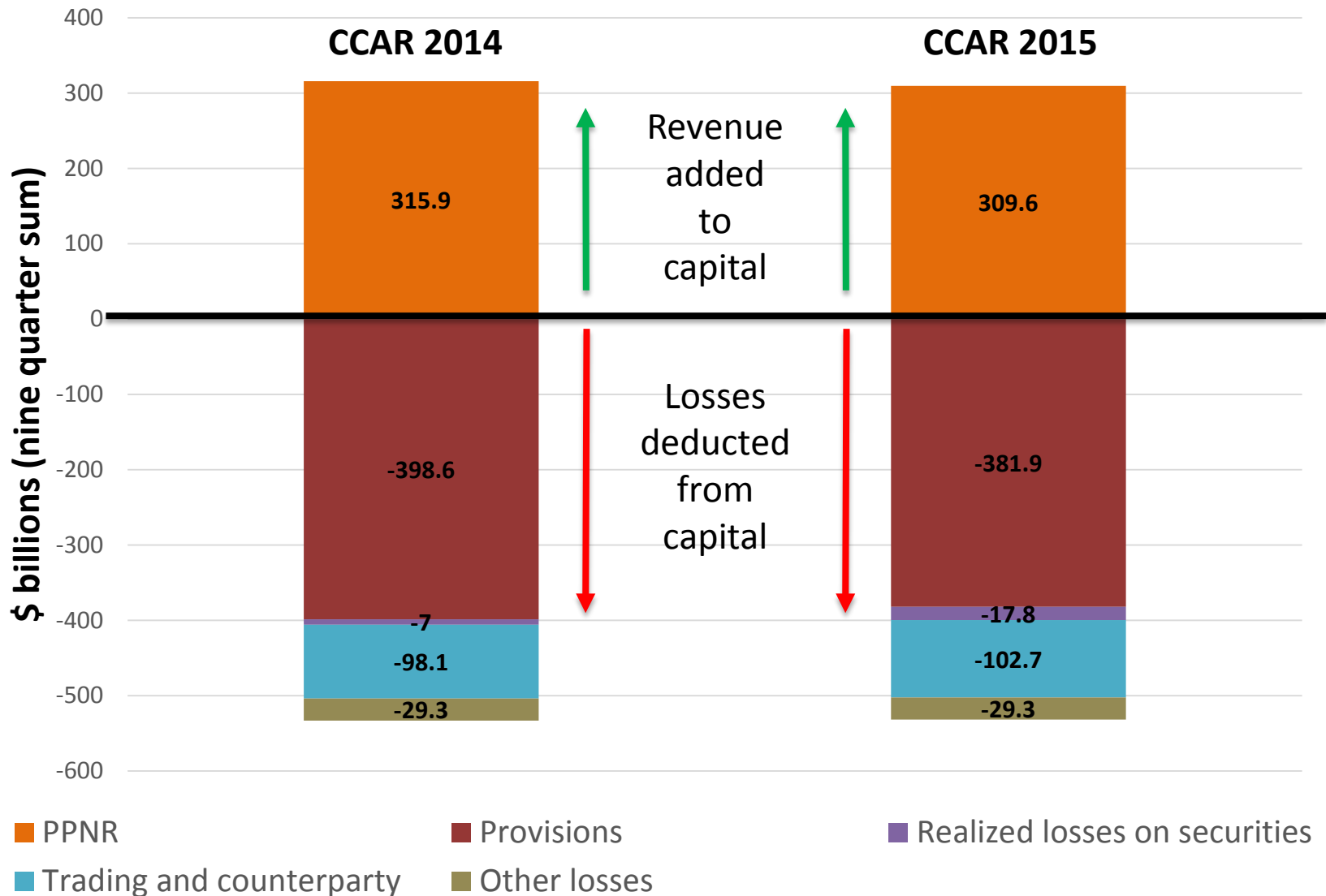
Fed PPNR results for the severely adverse scenario in CCAR 2015
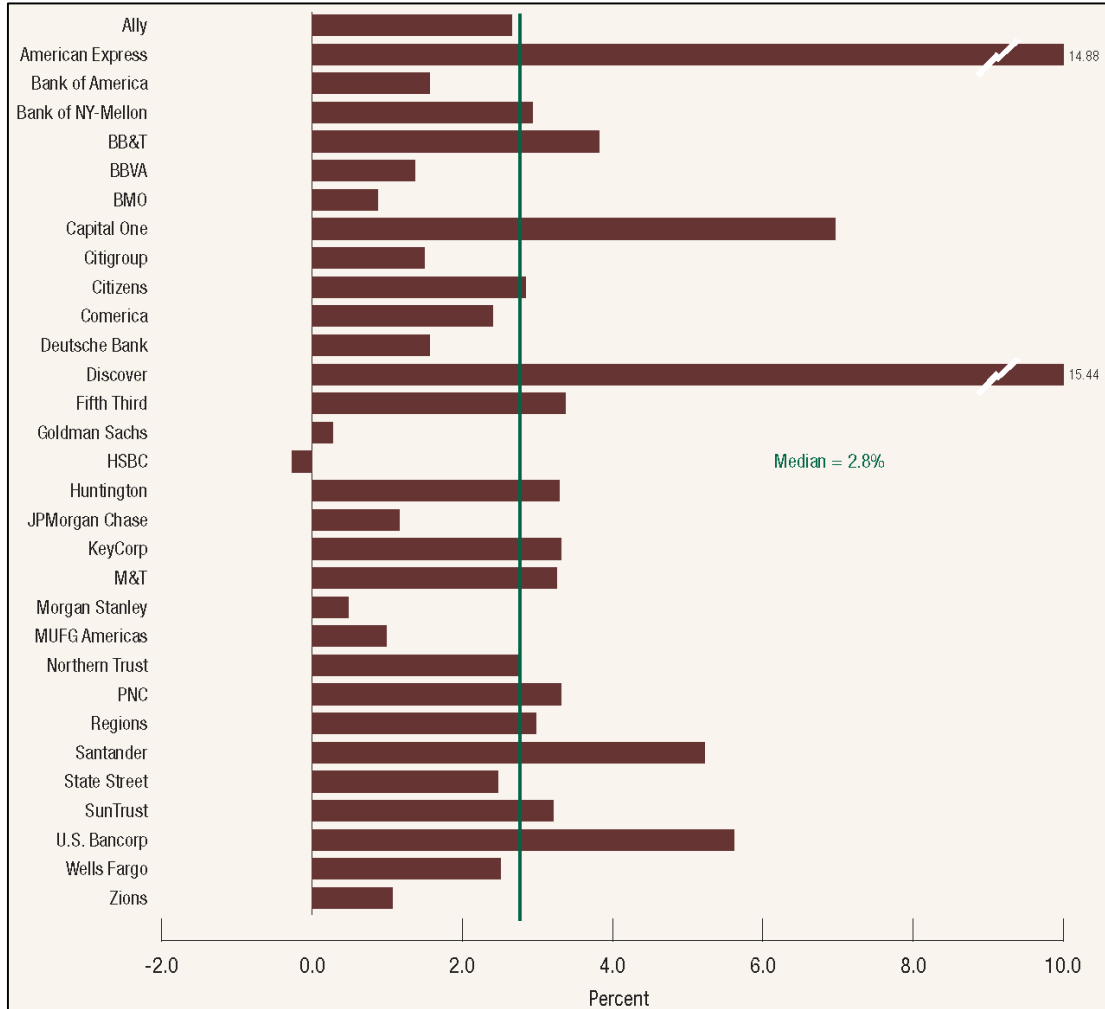
From: Dodd-Frank Act Stress Test 2015: Supervisory Stress Test Methodology and Results

Fed total loan loss rate results for the SA scenario in CCAR 2015
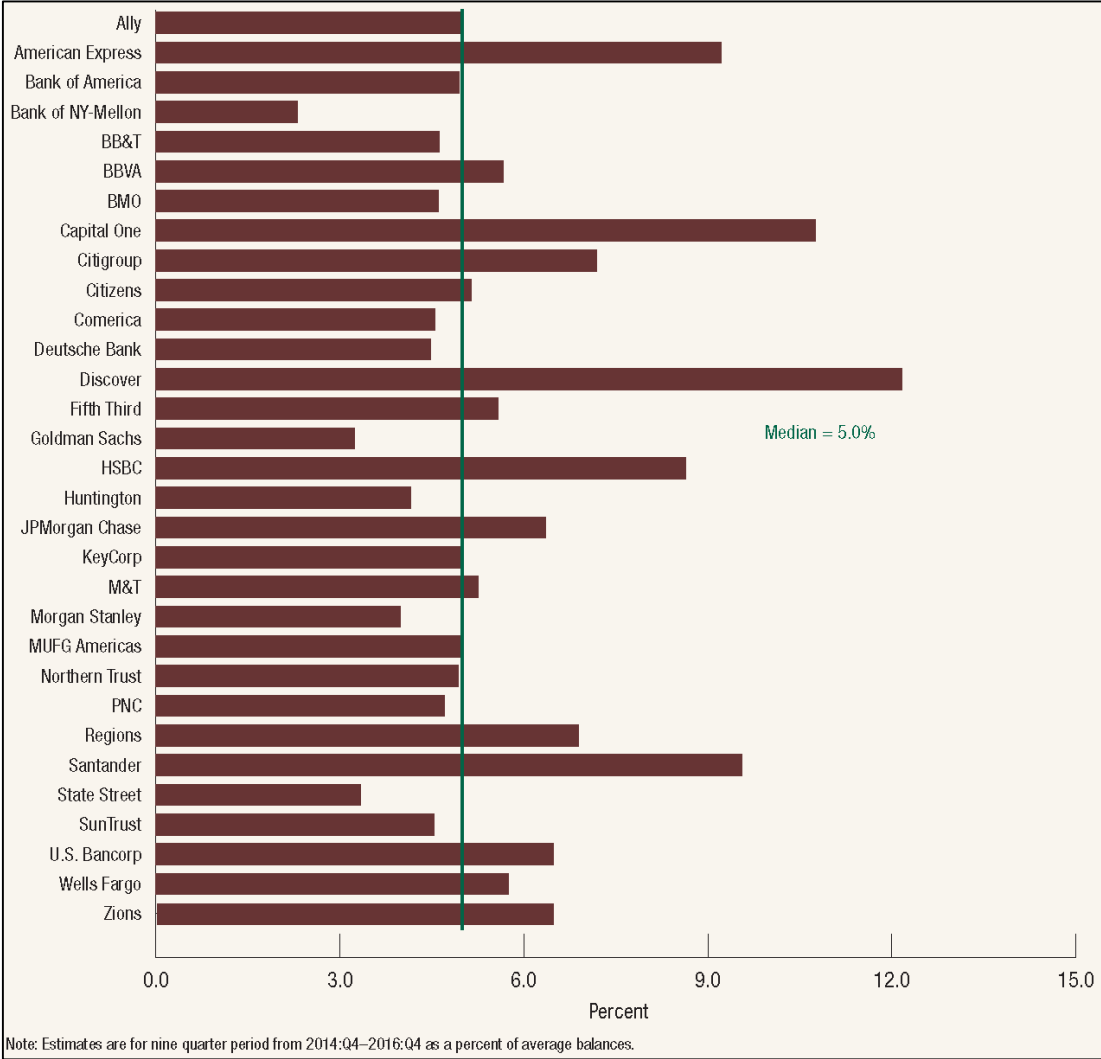
From: Dodd-Frank Act Stress Test 2015: Supervisory Stress Test Methodology and Results

Fed pre-tax net income results for the SA scenario in CCAR 2015

From: Dodd-Frank Act Stress Test 2015: Supervisory Stress Test Methodology and Results
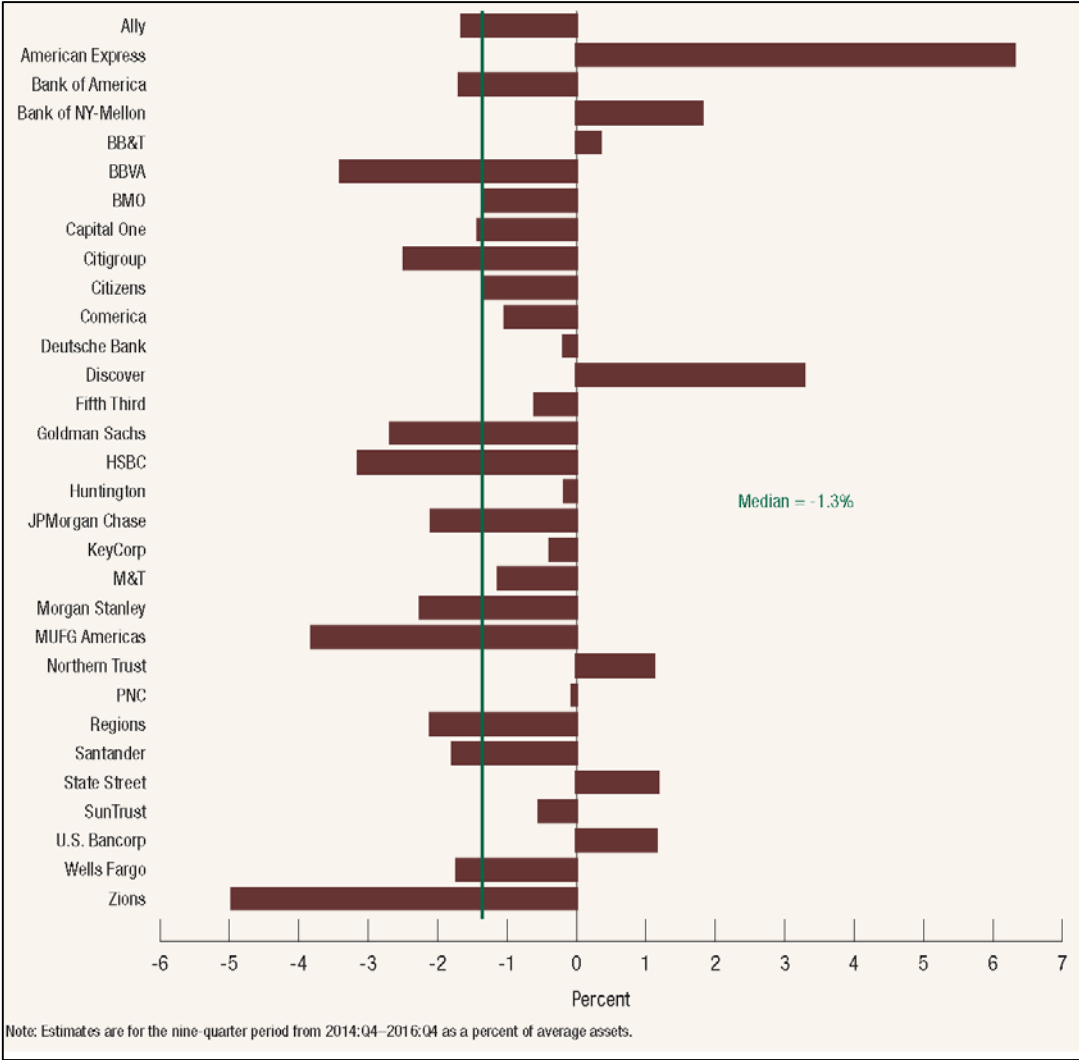
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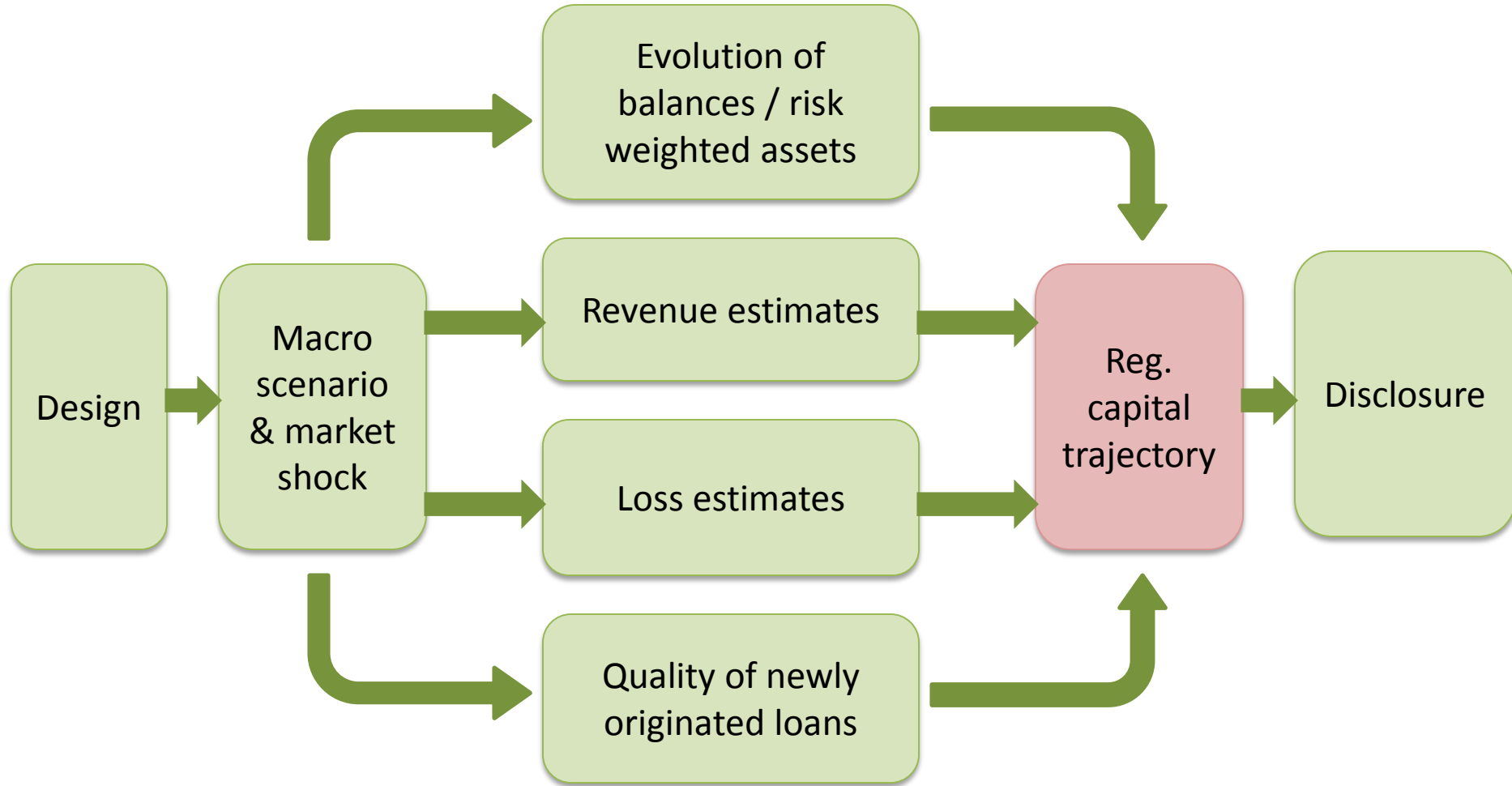
Example of the capital waterfall in CCAR vs. DFAST

Independently calculated by the Federal Reserve, based on firm-supplied data and Fed models.

Firms' planned capital actions under the baseline, but applied to the stress scenario.

Average dividends paid out over the previous four quarters.

Chart categories (x-axis):
- Starting tier 1 common
- Net losses (losses less PPNR)
- DFAST standardized capital distributions
- CCAR capital plan proposed distributions
- Post-CCAR tier 1 common

Y-axis: 0% to 16%

Minimum tier one common capital ratios in DFAST 2015

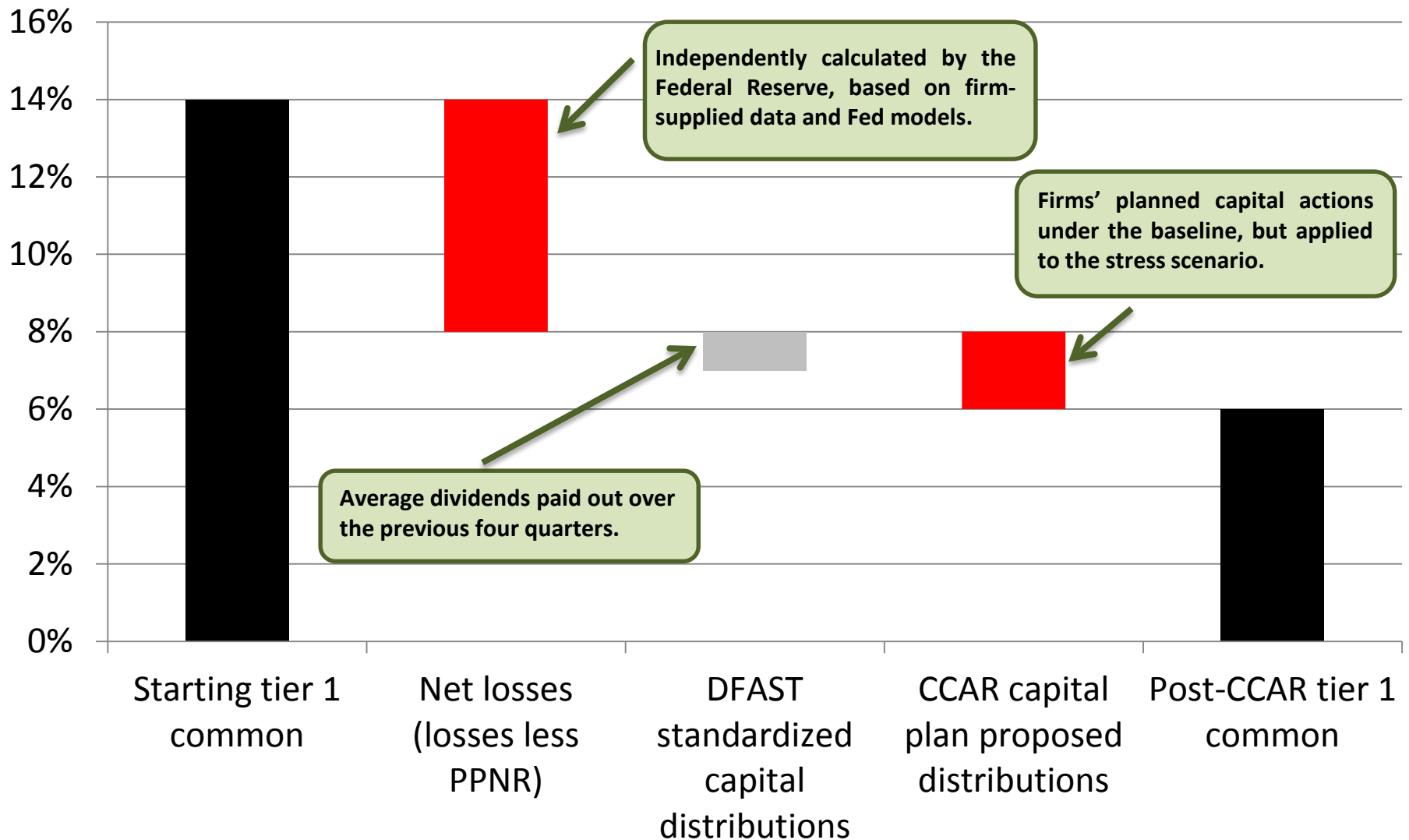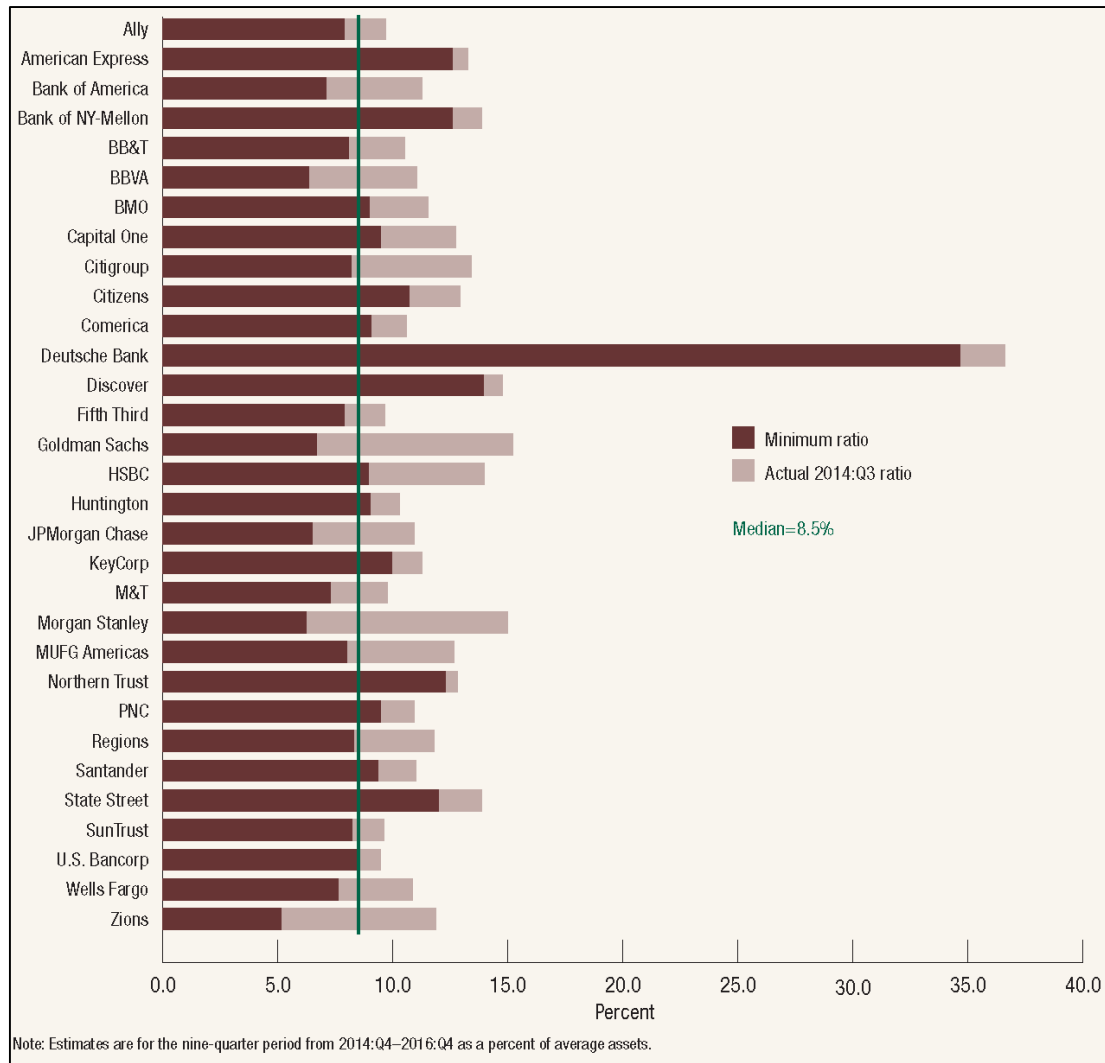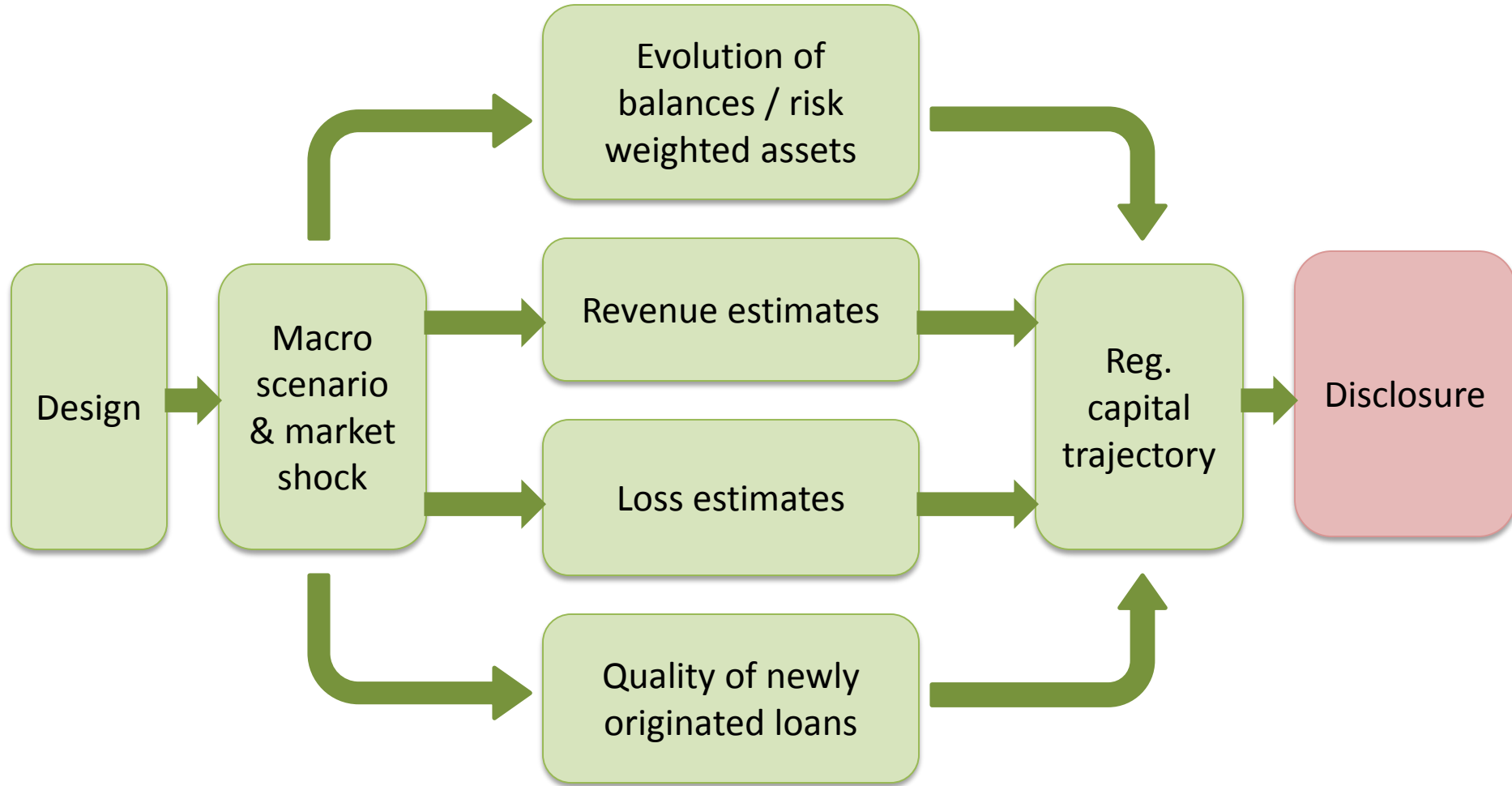From: Dodd-Frank Act Stress Test 2015: Supervisory Stress Test Methodology and Results

Steps in the quantitative assessment

Disclosure

Table 2. 31 participating bank holding companies
Projected stressed capital ratios, risk-weighted assets, losses, revenues, net income before taxes, and loan losses
Federal Reserve estimates: Severely adverse scenario

Actual 2014:Q3 projected stressed capital ratios through 2016:Q4

	Actual 2014:Q3	Stressed capital ratios[1]	
		Ending	Minimum
Tier 1 common ratio (%)	11.9	8.4	8.3
Common equity tier 1 capital ratio (%)[2]	n/a	7.8	7.6
Tier 1 risk-based capital ratio (%)	13.5	8.6	8.4
Total risk-based capital ratio (%)	16.2	11.0	10.8
Tier 1 leverage ratio (%)	8.8	5.9	5.9

Projected loan losses, by type of loan, 2014:Q4–2016:Q4

	Billions of dollars	Portfolio loss rates (%)[1]
Loan losses	340.3	6.1
First-lien mortgages, domestic	39.7	3.6
Junior liens and HELOCs, domestic	34.0	8.0
Commercial and industrial[2]	67.8	5.4
Commercial real estate, domestic	52.8	8.6
Credit cards	82.9	13.1
Other consumer[3]	35.1	5.8
Other loans[4]	28.0	2.9

Actual 2014:Q3 and projected 2016:Q4 risk-weighted assets

	Actual 2014:Q3	Projected 2016:Q4	
		General approach	Standardized approach
Risk-weighted assets (billions of dollars)[1]	8,790.2	9,103.4	9,948.4

Projected losses, revenue, net income and other comprehensive income through 2016:Q4

	Billions of dollars	Percent of average assets[1]
Pre-provision net revenue[2]	309.6	2.1
Other revenue[3]	0.0	
less		
Provisions	381.9	
Realized losses/gains on securities (AFS/HTM)	17.8	
Trading and counterparty losses[4]	102.7	
Other losses/gains[5]	29.3	
equals		
Net income before taxes	-222.2	-1.5
Memo items		
Other comprehensive income[6]	-12.4	
Other effects on capital	*Actual 2014:Q3*	*2016:Q4*
AOCI included in capital (billions of dollars)[7]	n/a	-27.9

- The same type of information is provided for all 31 of the banks in the CCAR/DFA stress tests

From: Dodd-Frank Act Stress Test 2015: Supervisory Stress Test Methodology and Results

Disclosure, continued

- Results in the baseline scenario have never been disclosed

- CCAR 2012 and all subsequent CCARs have disclosed bank-level results by type of exposure for the severely adverse scenario

- DFAST 2013 disclosed severely adverse scenario results only but all subsequent DFASTs have disclosed results for both scenarios

- Disclosing results – even outside of stress periods – can be valuable
  - Results provide the market with information on banks' risks in normal times, promoting transparency and market discipline

- Disclosing results beyond top-line results also
  - Increases stress-test credibility, by showing how supervisors came to their final results
  - Increases the information on banks' risks available to the market

Concluding thoughts

- Stress tests are an important supervisory tool for
  - Assessing bank capital plans
  - Increasing the transparency of bank risks
  - Fostering market discipline

- The use of stress tests in supervision, nonetheless, also presents risks
  - Banks may focus on back engineering CCAR and ignore other risks
  - The credibility of supervisory stress testing would be questioned by the collapse of a bank, even if for idiosyncratic reasons

- The use of supervisory stress tests is new and continues to develop
  - The methodologies used for CCAR and DFAST are not static
  - The Fed continues to investigate ways to improve CCAR along all of the dimensions discussed here