“SOURCES OF SYSTEMIC RISK”

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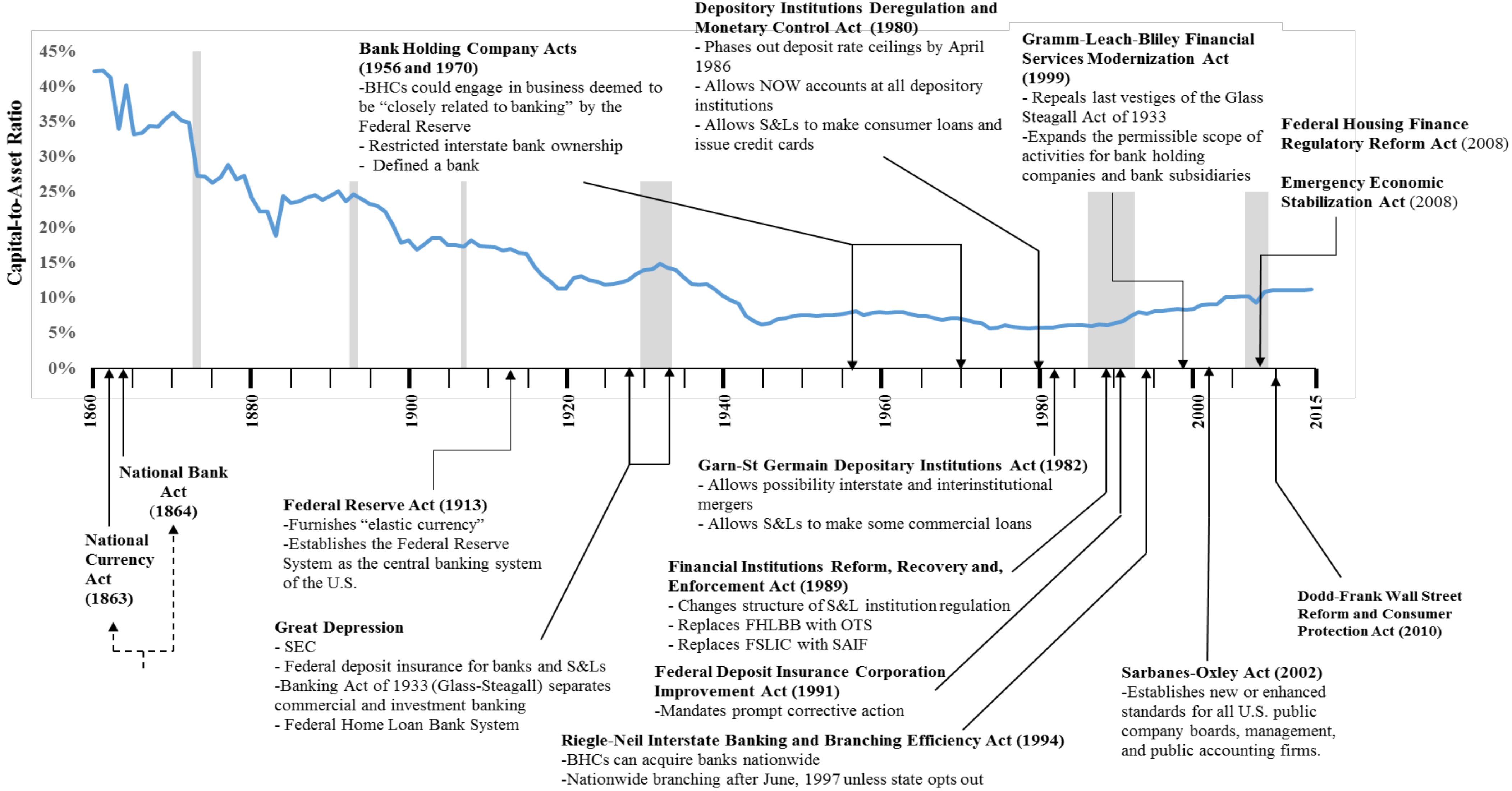
Systemic Risk:
Definition and Sources

- **Definition**: Events that threaten the stability of the financial system, and thus real economic activity.
- **Sources**: Bank runs (historically the key driver); falling asset prices (e.g., real estate prices); contagion (TBTF); sovereign bond defaults (e.g., Greece); maturity and foreign exchange mismatches; collapse of payment system, interbank market and repo market; uncertainty; and government policies (e.g., loose monetary policy and excessive availability of credit, Freddie Mac and Fannie Mae).
- **Identification and Measurement**: GSIFIs, DSIFIs, DFAST and CCAR (see Acharya and Engle, https://vlab.stern.nyu.edu/en/welcome/risk/).

A History of Crises and Governmental Response:
More Laws & Lower Capital-to-Asset Ratio



A History of Crises and Governmental Response:
More Regulators

Identify emerging systemic risks and improve interagency cooperation
- Financial Stability Oversight Council (Treasury, Fed, OCC, CFPB, SEC, CFTC, FDIC, FHFA, NCUA, OFR, FIO and three state regulators)

Nonbank financial and bank holding companies posing systemic risk
- Federal Reserve

Fannie Mae, Freddie Mac, and Federal Home Loan Banks
- Federal Housing Finance Agency

Protect consumers across the financial sector from unfair, deceptive, and abusive practices
- Consumer Financial Protection Bureau

Credit Unions
- National Credit Union Administration
- State credit union regulators

Fed is the regulator when subsidiaries include a commercial or savings bank

Primary/ secondary functional regulator

National commercial banks and federal savings banks
- OCC
- FDIC

Foreign branch
- OCC
- Host country regulator

State commercial and savings banks
- State bank regulators
- FDIC
- Fed--state member commercial banks

Foreign branch
- Fed
- Host country regulator

Hedge funds, private equity funds and venture capital funds
- SEC

Insurance companies
- 50 State insurance regulators plus District of Columbia and Puerto Rico

Securities brokers/dealers
- FINRA
- SEC
- CFTC
- State securities regulators

Other financial companies, including mortgage companies
- Fed
- State licensing (if needed)
- U.S. Treasury for some products

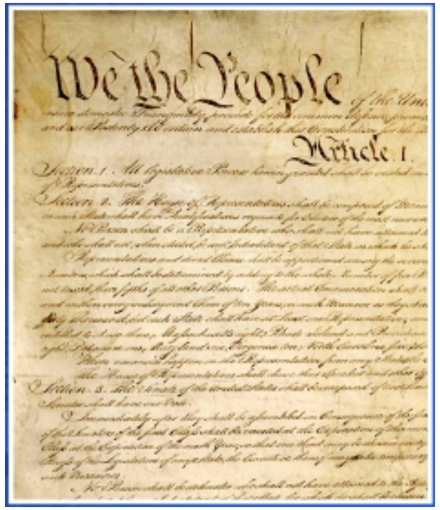
Justice Department
- Assesses effects of mergers and acquisitions on competition

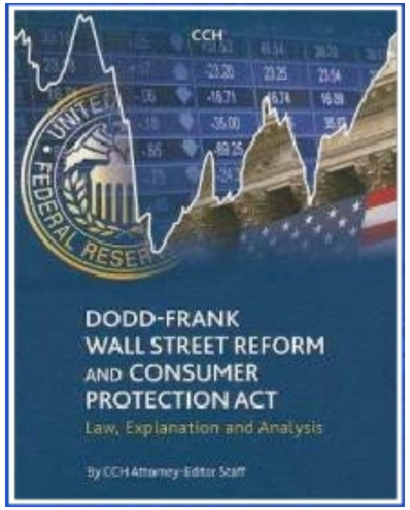
Federal courts
- Ultimate decider of banking, securities, and insurance products

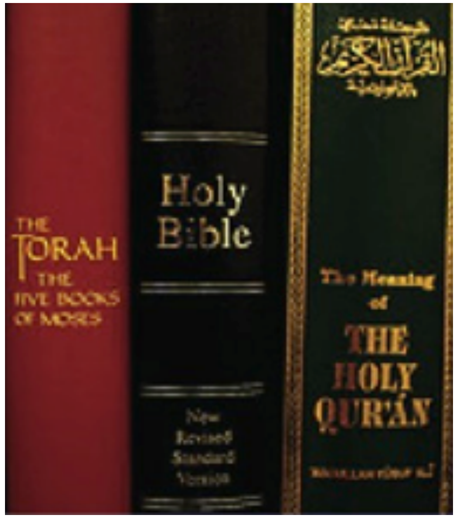
The First Great Financial Crisis of the 21st Century

- The 2007-2009 Financial Crisis: Cost topped $22 trillion, GAO says.
- Unemployment: Rate peaked at 10.1 percent in October 2009.
- Government Bailouts: The government poured about $23 trillion into a host of programs and bailouts.
- Lost Household Wealth: When home prices tanked, there was an estimated loss of $7 trillion in the real estate industry. The stock market declined contributing another $11 trillion in losses, and retirement accounts lost $3.4 trillion.

Dodd-Frank Act:
Regulation Complexity







6 pages

More than 2,000 pages…

… longer than the Torah, Bible and Quran COMBINED!

Basel Capital Accords:
Capital Complexity

Regulatory capital requirements	US minimum capital standards based on Basel I (%)		Basel II (%)	Basel II.5 (%)	Basel III (%)						
	1991–1992	1993–2010	2011	2012	2013	2014	2015	2016	2017	2018	as of 1 Jan 2019
Minimum Tier 1 capital (CET1 + additional Tier 1)	3.625	4.0	4.0	4.0	4.5	5.5	6.0	6.0	6.0	6.0	**6.0**
Minimum total capital (Tier 1 + Tier 2 capital)	7.25	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	**8.0**
Tier 1 leverage ratio and supplementary leverage ratio (viewed as a complement to risk-based ratios)	------------------------ 4 (3 for banks that are CAMELS 1-rated) ------------------------						4	4	4	3 (AA) 5 (GSIBs and 6 for their IDIs) 4 (NAA)	**3 (AA)** **5 (GSIBs and 6 for their IDIs)** **4 (NAA)**
Minimum CET1 capital ratio (introduced in 2009 in the United States)	n/a	n/a	n/a	n/a	3.5	4.0	4.5	4.5	4.5	4.5	**4.5**
Phase-in of deductions from CET1 (including amounts exceeding the limit for deferred tax assets, mortgage servicing rights, and financials)	n/a	n/a	n/a	n/a	n/a	20.0	40.0	60.0	80.0	100.0	**100.0**
Capital conservation buffer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.625	1.25	1.875	**2.5**
Countercyclical capital buffer for AA banks (discretionary, 0.0% to 2.5%)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.625	1.25	1.875	**2.5**
Capital surcharge for GSIBs	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.25 to 4.5	0.50 to 4.5	0.75 to 4.5	**1 to 4.5**
Capital instruments that no longer qualify as CET1 or Tier 1 capital	n/a	n/a	n/a	n/a	n/a	80	60	40	20	0	**0**

Citigroup:
Different Financial Ratios Provide Different Information

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Actual Tier 1 Capital Ratio Minus Required Minimum Tier 1 Capital Ratio of 4 Percent	4.38	4.42	4.47	4.91	4.74	4.79	4.59	3.12	7.92	7.67	8.91	9.55	10.06	9.2	7.6	6.91
Actual Total Capital Ratio Minus Required Minimum Total Capital Ratio of 8 Percent	3.23	2.92	3.25	4.04	3.85	4.02	3.65	2.7	7.7	7.25	8.59	8.99	9.26	8.68	6.53	N.A.
Risk-Weighted Assets as a Percentage of Total Assets	72	66	63	59	57	59	56	57	51	59	51	52	52	58	70	70
Actual Leverage Ratio Minus Required Minimum Leverage Ratio of 4 Percent	1.97	1.64	1.49	1.56	1.2	1.35	1.16	0.03	2.08	2.89	2.6	3.19	3.48	4.2	5.03	5.86
Actual Tangible Common Equity Ratio Minus Assumed Required Minimum Tangible Common Equity Ratio of 4 Percent	1.52	0.98	0.7	0.53	0.51	0.68	-0.21	-1.28	-2.44	2.49	2.89	3.9	4.46	5.05	5.47	6.06
Market Capitalization to Book Value Ratio	3.98	3.26	2.12	2.58	2.31	2.17	2.3	1.3	0.52	0.62	0.84	0.43	0.64	0.8	0.82	0.72