

The Decline of Too Big to Fail

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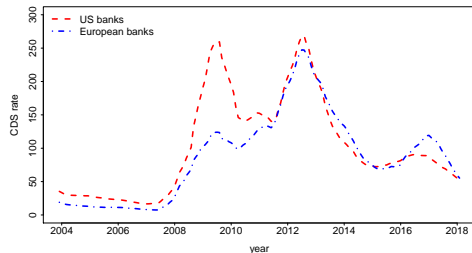
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Big-bank credit spreads got much higher after the crisis



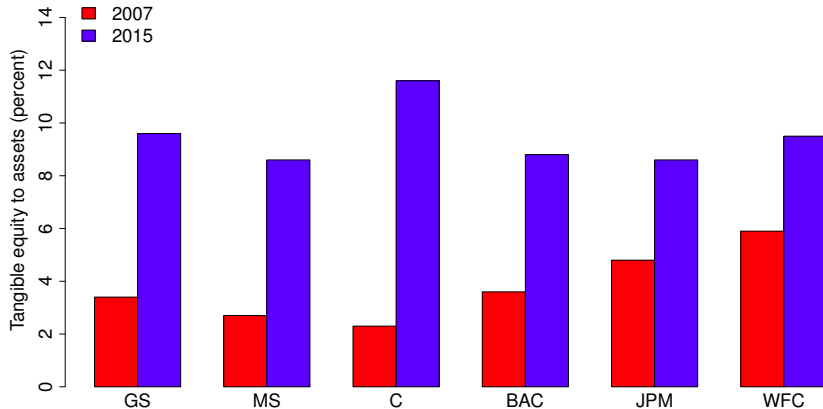
(a) One-year LIBOR-OIS spreads



(b) 5-year CDS rates.

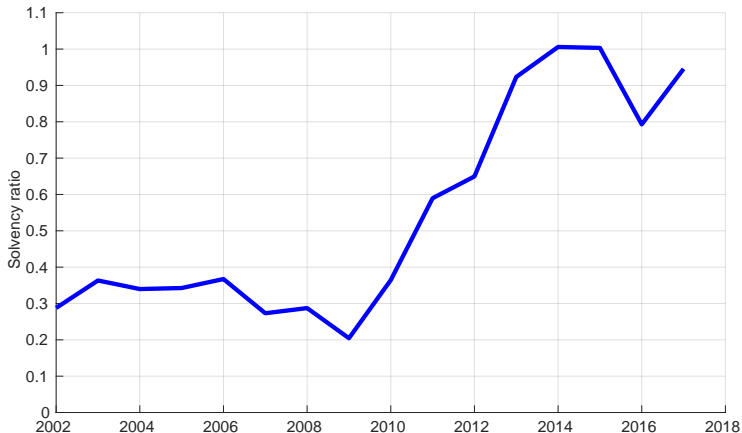
Figure: (a) Spread between one-year USD LIBOR and one-year OIS (Fed funds). (b) Averages of the 5-year CDS rates of five U.S. banks (JPM, Citi, BAC, MS, GS) and of five European banks (Deutsche Bank, BNP, SocGen, Barclays, RBS). Data source: Bloomberg.

Is this consistent with the improved capitalization of big banks?



Ratio of tangible equity to assets. Data source: Holding company 10K filings.

The solvency buffers of big U.S. banks have gotten much larger

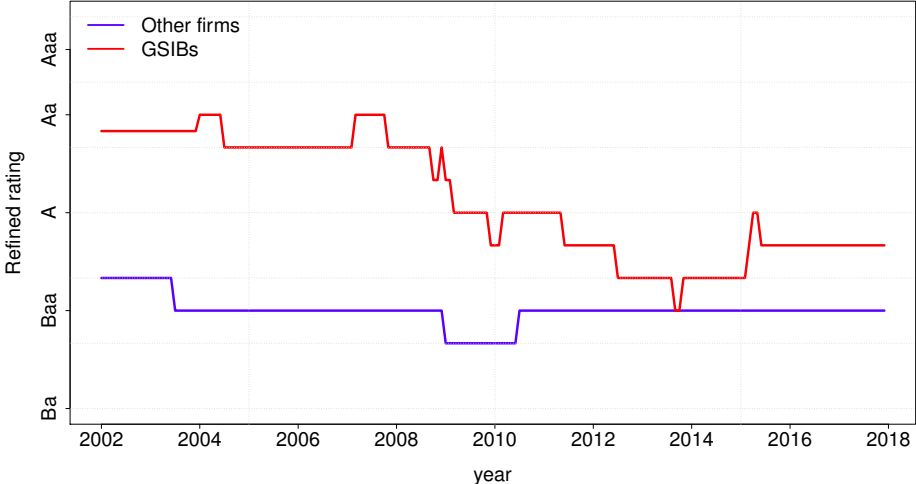


Tangible equity divided by an estimate of the standard deviation of the annual change in asset value. Asset-weighted averages. Data: 10Ks of JPM, BOA, CITI, WF, GS, MS, ML, LB, BS, including preceding mergers, pro forma.

Post crisis, do creditors of large banks place less reliance on bailouts?

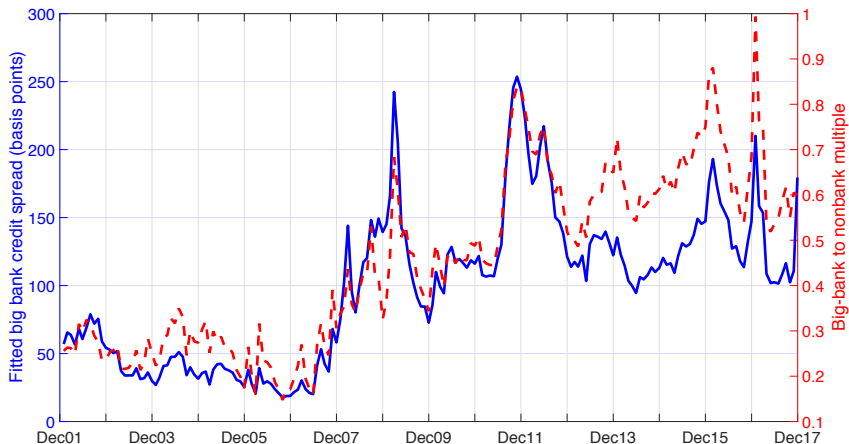
- ▶ The EU Bank Recovery and Resolution Directive and Title II of the U.S. Dodd-Frank Act shift expected insolvency losses from taxpayers to wholesale creditors.
- ▶ Conditional on the insolvency of a big bank, we estimate significantly reduced market-implied probabilities of bailout.
- ▶ We estimate corresponding increases in credit spreads at a given distance to default, and associated reductions in equity subsidies and subsidy-induced leverage.

Sovereign uplifts have disappeared from big-bank credit ratings



Data source: Moody's Investor Service. Ratings are adjusted for Watchlist and Outlook

Estimated 5-year CDS rates of big banks at a fixed distance to default

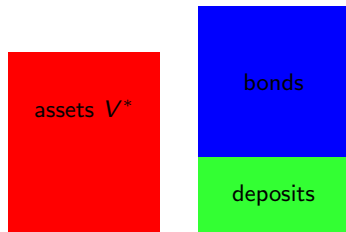


Fitted CDS for U.S. G-SIB holding companies at a distance to default of 2, before correcting for endogenous default boundary, and the ratio of big-bank to non-bank time-fixed-effect multipliers.

Some prior work on post-crisis declines in TBTF subsidies

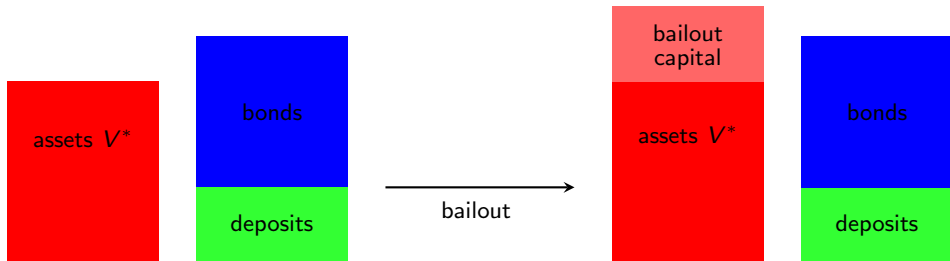
- ▶ Acharya, Anginer, Warburton (2016). *"We find that passage of Dodd-Frank Act did not significantly alter investor expectations of future government support for large financial institutions."*
- ▶ Neuberger, Glasserman, Kay, and Rajan (2018). For Europe, an increase in CDS-implied bail-in protection of senior debt in 2014, reversed in 2016.
- ▶ Atkeson, d'Avernas, Eisfeldt, and Weill (2018). For a stylized composite U.S. bank and the Gordon dividend-discount model based on historical aggregate U.S. bank accounting returns, an estimated post-crisis 23% decline in the market-to-book ratio associated with bailout subsidies.

Balance sheet at insolvency



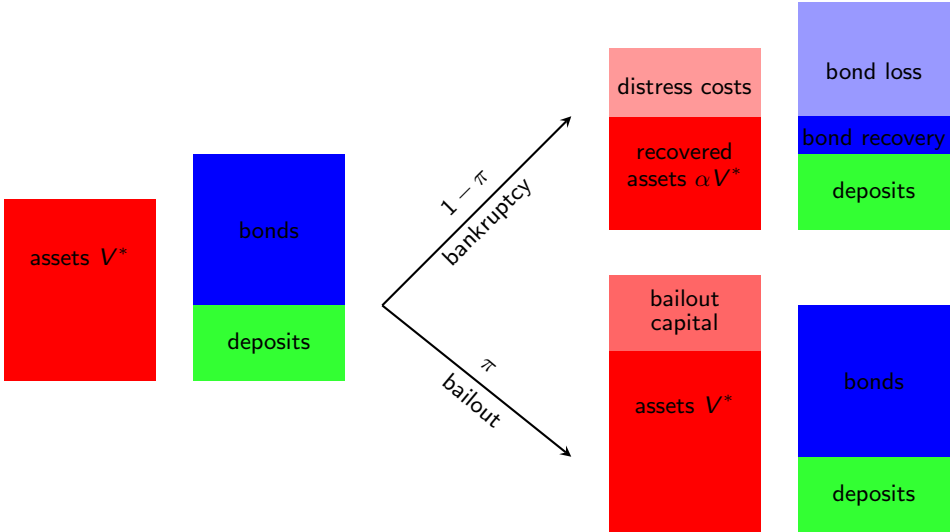
Bank equity owners default whenever assets drop to an endogenous level V^* .

The bailout model

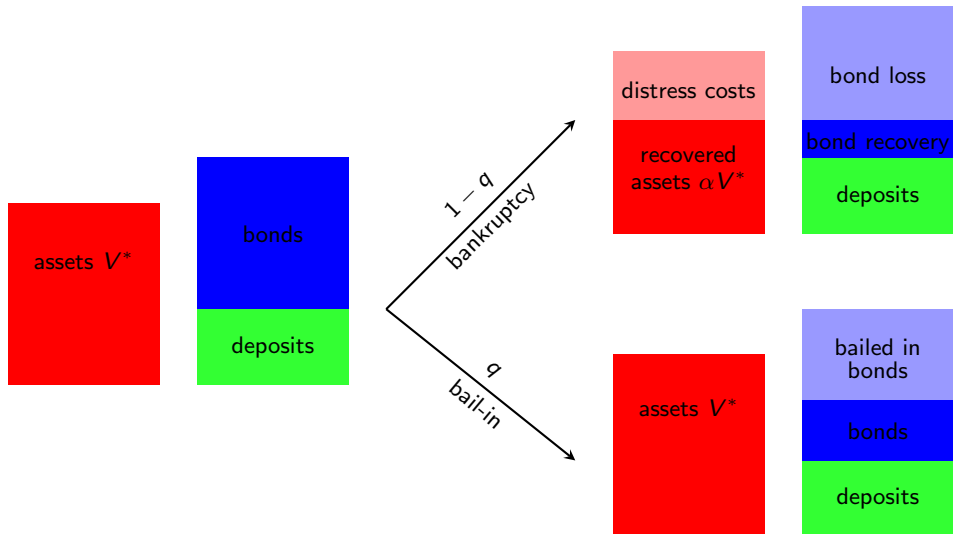


The modeled bailout, if it occurs, injects enough government capital to increase the market value of the bonds to par, giving all equity to the government.

Unpredictable bailout

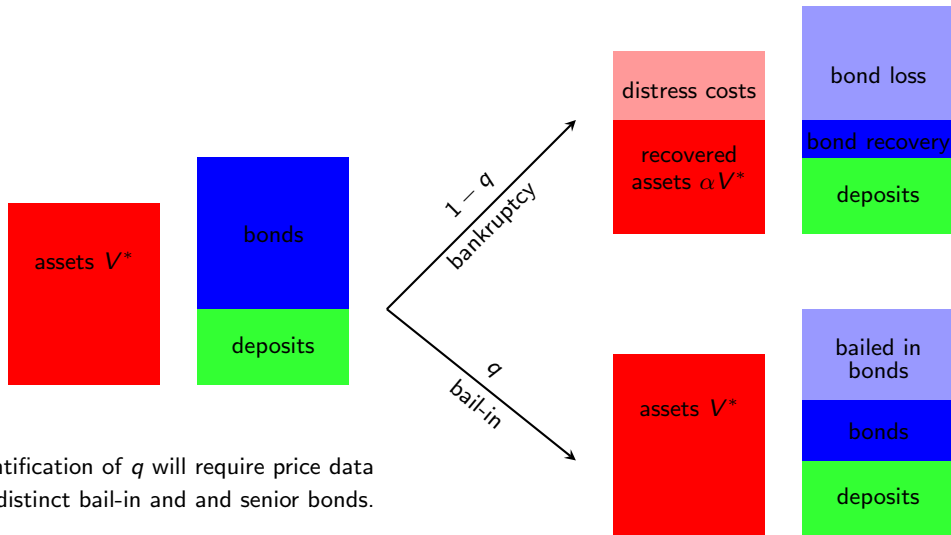


Conditional on no bailout: bankruptcy or bail-in



Reference: Chen, Glasserman, Nouri, and Pelger (2015); Neuberger, Glasserman, Kay, and Rajan (2016).

Bail-in and bankruptcy have similar impacts on equity and senior bonds



Identification of q will require price data for distinct bail-in and senior bonds.

Simplified model of a bank

- ▶ The bank's assets in place satisfy

$$dV_t = (r - k)V_t dt + \sigma V_t dZ_t,$$

for a “risk-neutral” standard brownian motion Z , where r is the risk-free rate and k is a constant.

- ▶ The bank's produce cash revenues at the rate δV_t , for some constant $\delta > 0$.
- ▶ Government guaranteed deposits of total amount D bear interest at rate R .
- ▶ Bonds have constant total principle P and coupon rate c , with an exponentially decaying maturity structure and average maturity $1/m$. (Leland, 1994)
- ▶ Maturing bonds are replaced with new issues at competitive market prices.

Model solution

- ▶ The cash flows available to the bank over the infinite horizon are $\{\delta V_t : t \geq 0\}$, plus debt tax shields, government deposit guarantees, and government bailout capital injections, minus bankruptcy distress costs.
- ▶ At a given asset level x , the current equity value $H(x)$ is the market value of all future cash flows less the sum of the market values of current creditor claims and all future government equity claims at successive bailouts.
- ▶ Among other quantities, we calculate
 - ▶ The equilibrium default boundary V^* using the smooth-fit condition $H'(V^*) = 0$.
 - ▶ The government capital injection $\hat{V} - V^*$ needed at bailout to bring the bonds to a specified yield spread s .

Big banks

G-SIBs

- ▶ Bank of New York Mellon, Bank of America, Citigroup, Goldman Sachs, JPMorgan Chase, Morgan Stanley, State Street and Wells Fargo.

D-SIBs: Big banks, beyond G-SIBs, that are sufficiently systemic to require stress tests under Fed's Comprehensive Capital Analysis and Review (CCAR) and Dodd-Frank Act stress test (DFAST)

- ▶ Ally Financial, American Express, BB&T, Capital One, CIT Group, Citizens Financial, Comerica, Discover Financial Services, Fifth Third Bancorp, Huntington Bancshares, KeyCorp, M&T Bank, Northern Trust, PNC, Regions Financial, Suntrust Banks, U.S. Bancorp and Zions Bancorporation.

Fitting post-crisis reductions in bailout probabilities

- ▶ We allow non-zero bailout probabilities for big banks only:

$$\begin{aligned}\pi_{it} &= \pi_{\text{pre}}, && \text{pre crisis} \\ &= \pi_{\text{post}}, && \text{post crisis.}\end{aligned}$$

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- ▶ Our specification allows for post-crisis changes in default-risk premia for big banks, but only in proportion to general increases in corporate default risk premia.
- ▶ Because big-bank LGD is hard to estimate, we cannot pin down both π_{pre} and π_{post} , so we estimate π_{pre} for stipulated π_{post} .
 - ▶ For example, setting $\pi_{\text{post}} = 0.2$, we estimate that $\pi_{\text{pre}} = 0.63$, with an asymptotic standard error of 0.01.
 - ▶ For $\pi_{\text{post}} = 0.0$, we estimate that $\pi_{\text{pre}} = 0.49$.

Identification strategy

- ▶ The simple credit spread relationship $S = pL(1 - \pi)$ implies

$$\log \frac{S}{1 - \pi} = \log p + \log L$$

- ▶ Berndt, Douglas, Duffie and Ferguson (2018): Variation in $\log p$ is explained by distance to default (DtD),

$$d_t(\pi) = \frac{\log V_t(\pi) - \log V^*(\pi)}{\sigma(\pi)},$$

and by controls for default risk premia

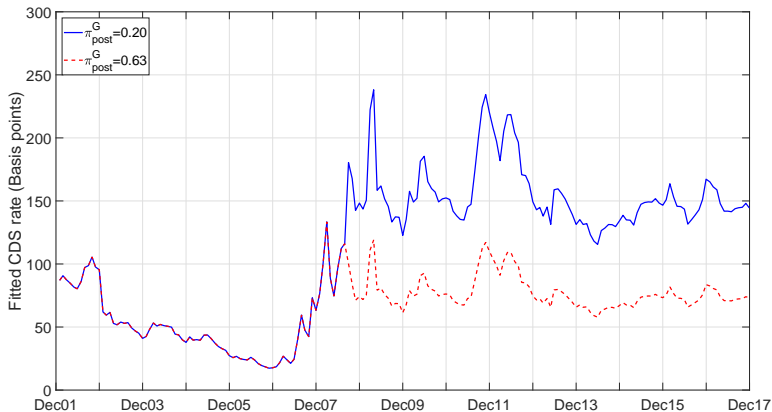
- ▶ We fit by nonlinear least squares a model of the form

$$\log \frac{S_{it}}{1 - \pi_{it}} = \alpha + \beta d_{it}(\pi_{it}) + \text{Controls}_{it} + \varepsilon_{it}.$$

Fitted bailout probabilities

π_{post}	π_{pre}^G	π_{pre}^D
0.30	0.67	0.60
0.20	0.63	0.52
0.10	0.56	0.46
0.00	0.49	0.36

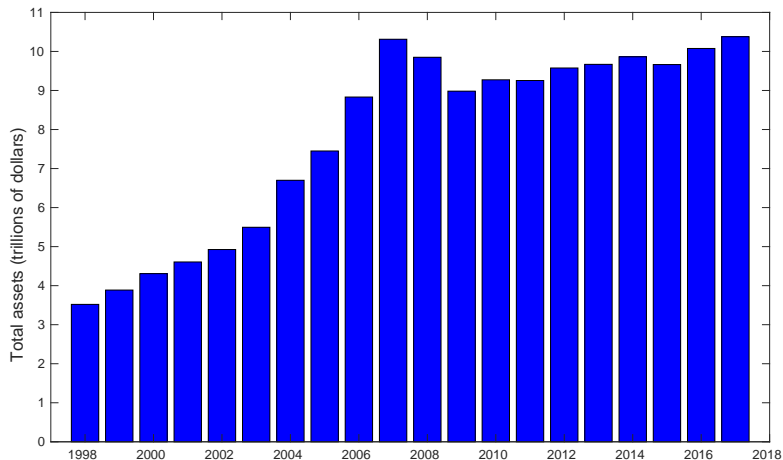
Fitted CDS rates for G-SIBs at distance to default of 2



Blue: Based on fitted $(\pi_{pre}^G, \pi_{post}^G) = (0.63, 0.2)$

Red: Based on counterfactual $(\pi_{pre}^G, \pi_{post}^G) = (0.63, 0.63)$

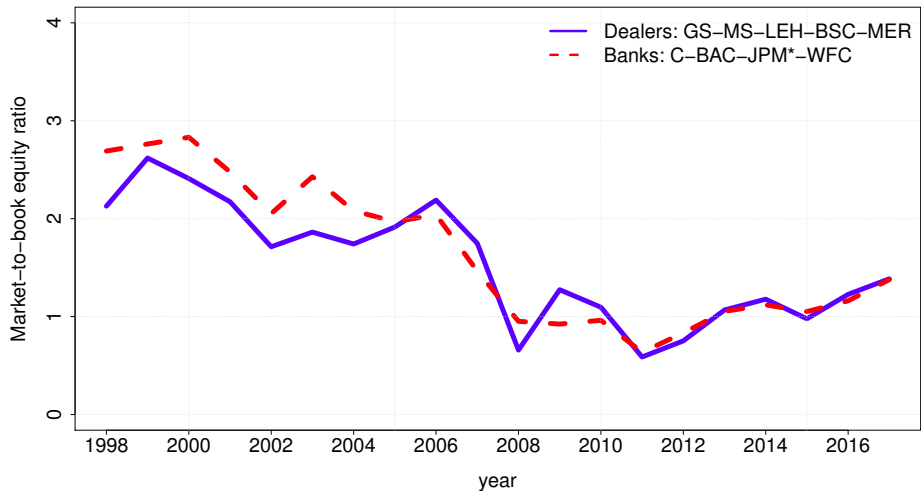
Total tangible assets of the largest U.S. banks



Data source: Tangible assets, from 10Ks of JPM, BOA, CITI, WF, GS, MS, LB, BS.

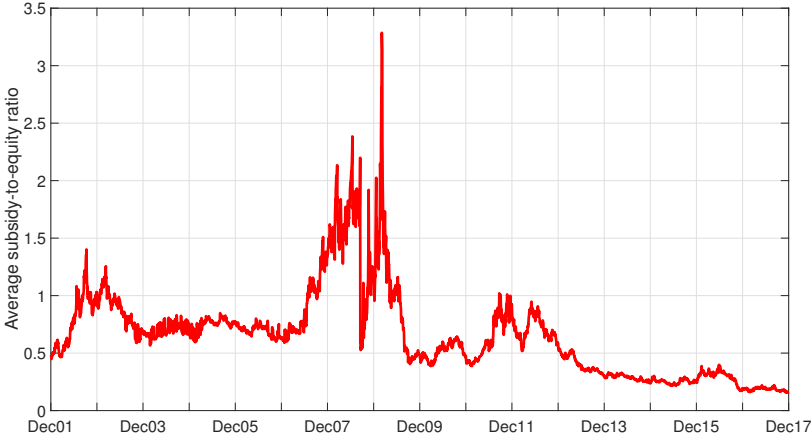
JPM and BOA include preceding mergers, pro forma.

Market-to-book equity ratios of big banks



Asset-weighted averages. J.P. Morgan includes preceding mergers, pro forma.

Average ratio of GSIB estimated bailout subsidy to equity market value



For $\pi_{\text{post}} = 0.2$ and fitted $\pi_{\text{pre}} = 0.65$, average of BoA, MS, C, JPM, GS, BNYM, WF.