The Decline of Too Big to Fail

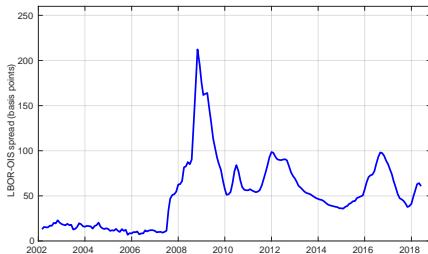Antje Berndt   Darrell Duffie   Yichao Zhu
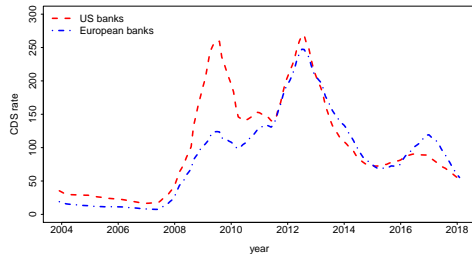ANU   Stanford   ANU

Virtual Finance Workshop
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Based on preliminary empirical estimates

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.
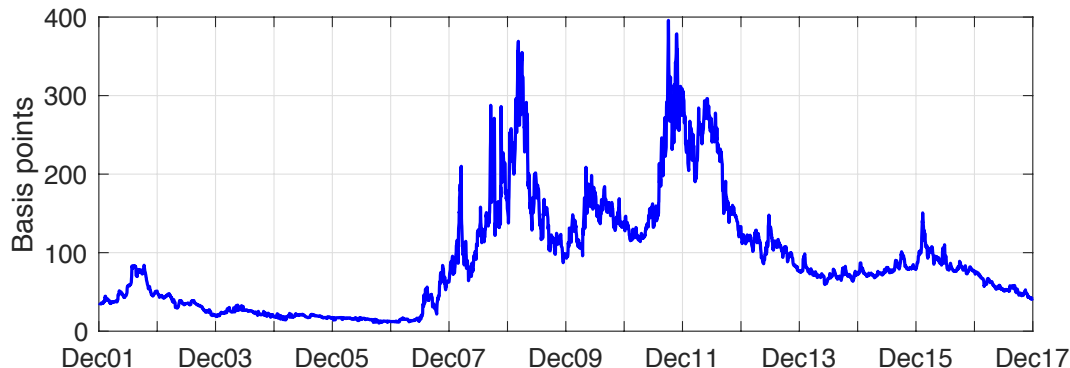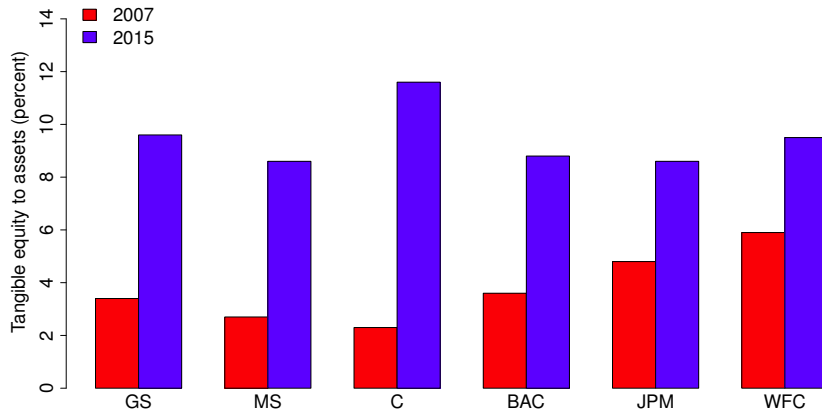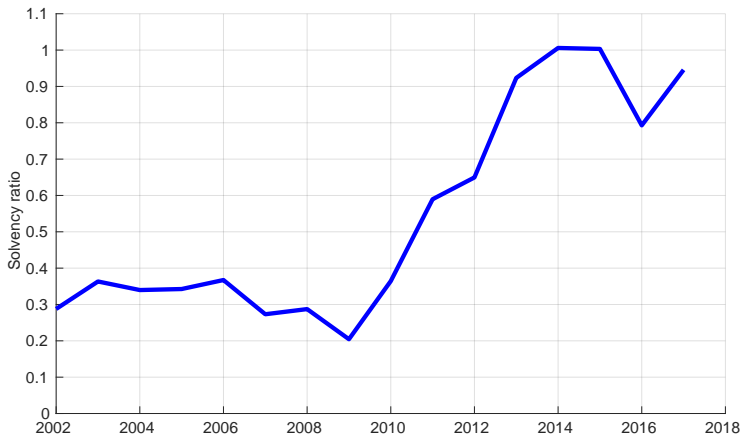
US G-SIB 5-year credit spreads

Figure: Median 5-year CDS rates of six U.S.-domiciled globally systemically important banks (GS, MS, C, BAC, JPM, WFC). Data source: Markit.

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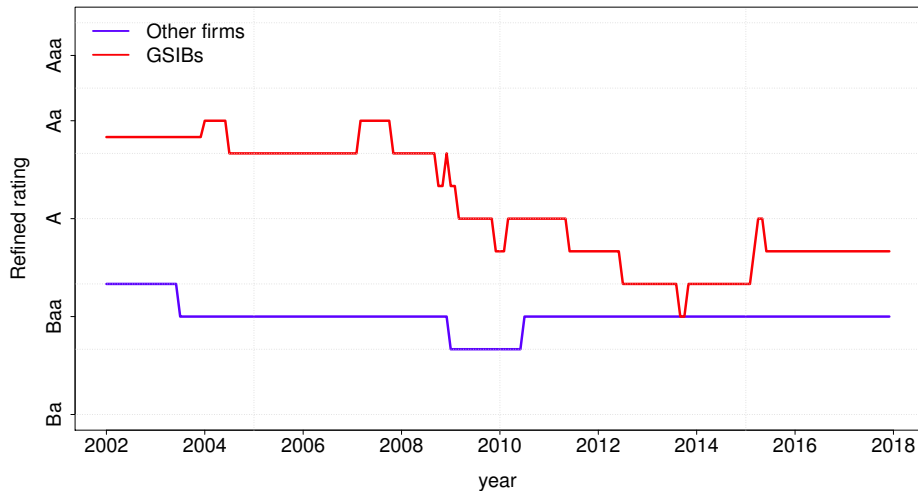
Data source: Moody's Investor Service. Ratings are adjusted for Watchlist and Outlook

# 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."*

▶ Neuberg, 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.
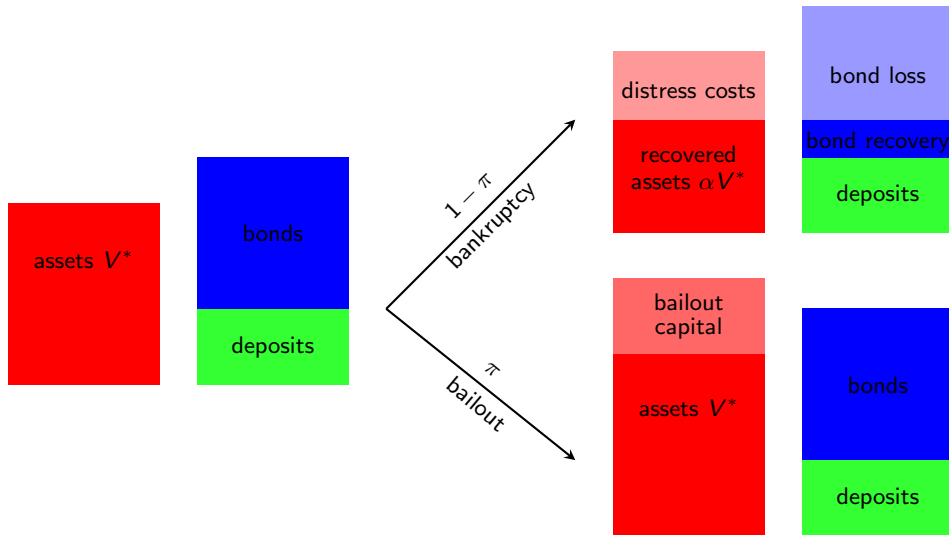
Balance sheet at insolvency
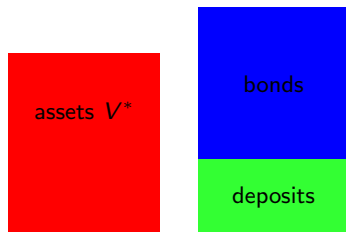
Bank equity owners default whenever assets drop to an endogenous level V^*.
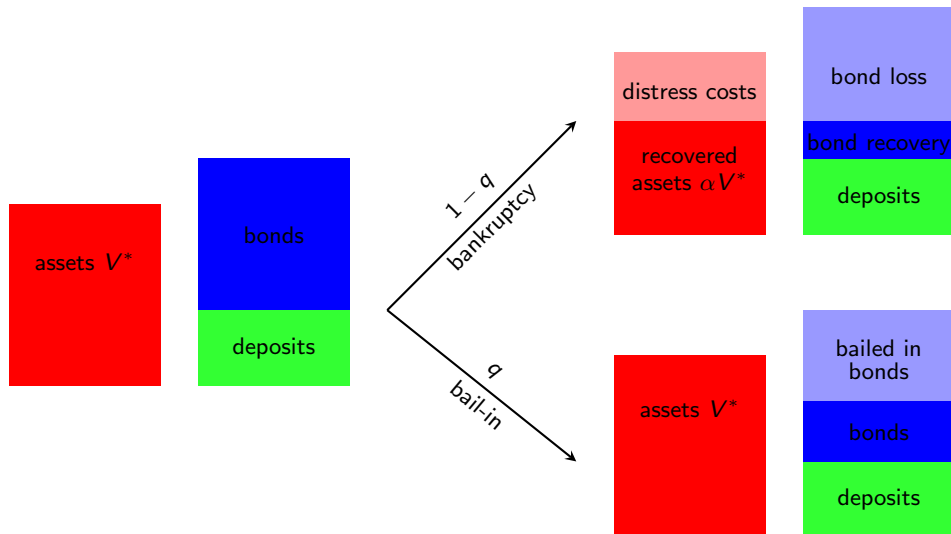
The bailout model
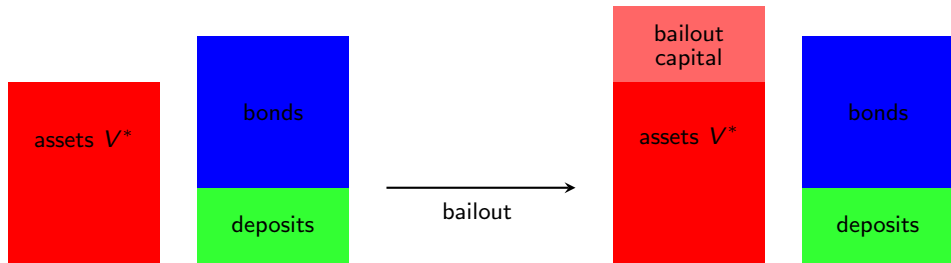
The modeled bailout, if it occurs, injects enough government capital to increase the market value of the bonds to par, giving all equity to the government.

Unpredictable bailout

Conditional on no bailout: bankruptcy or bail-in

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

Simplified model of a bank

▶ The bank's assets in place satisfy

$$dV_t = (r - k)V_t \, dt + \sigma V_{t-} \, dZ_t,$$

where Z is a "risk-neutral" martingale Lévy process (Brownian plus jumps), 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.

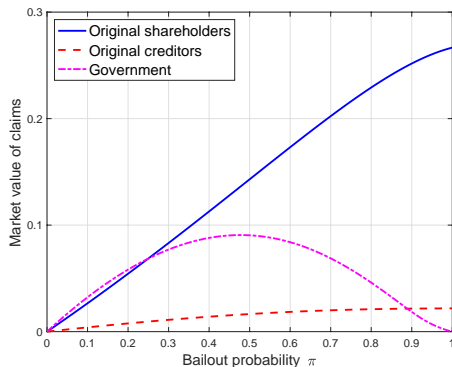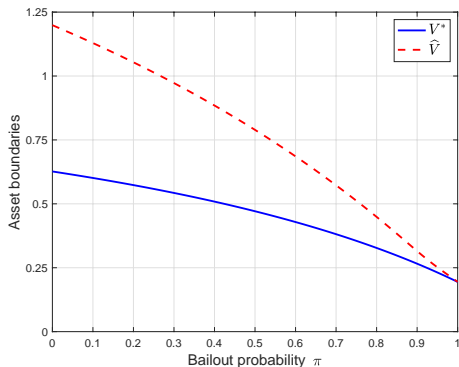# Illustrative case: Goldman Sachs, December 2007

Figure: Scaling to the initial asset level $V_0 = 1$, V^* is the default boundary, and $\hat{V} - V^*$ is the government capital injection at bailouts. The right-hand figure shows the market value of the bailout subsidy to original shareholders, the market value of the bailout subsidy to original creditors, and the initial market value of government equity claims taken at all future bailouts.

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.

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

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

Fitted bailout probabilities

▶ Conditional on the insolvency of a big bank, we estimate significantly reduced market-implied probabilities of bailout:

π_{post}	π_{pre}^{G}	π_{pre}^{D}
0.30	0.70	0.51
0.20	**0.65**	**0.43**
0.10	0.62	0.36
0.00	0.60	0.31

▶ We estimate corresponding increases in credit spreads at a given distance to default, and associated reductions in equity subsidies.

Economic magnitudes

▶ A hypothetical reduction in π_{pre}^G from 0.65 (estimated level) to 0.2 (assumed post-Lehman level) would have lowered G-SIB equity market values by 29%, on average, during the pre-Lehman period.

▶ At a fixed distance to default, a reduction in π^G from 0.65 to 0.2 implies post-Lehman senior unsecured G-SIB yield spreads that are roughly twice what they would have been had there been no decline in π.
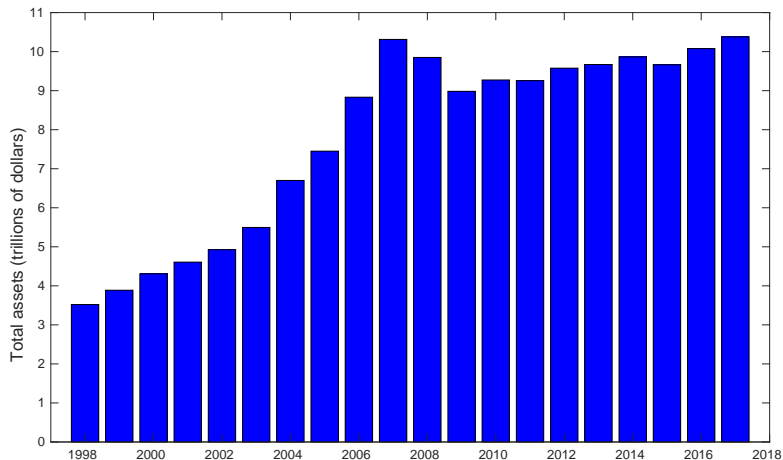
Fitted 5-year credit spreads for G-SIBs at distance to default of 2
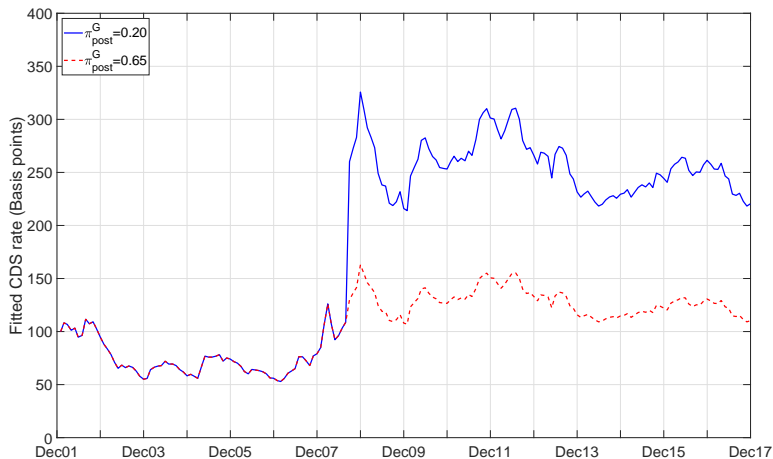
Blue: Fitted $(\pi_{\text{pre}}^G, \pi_{\text{post}}^G) = (0.65, 0.2)$
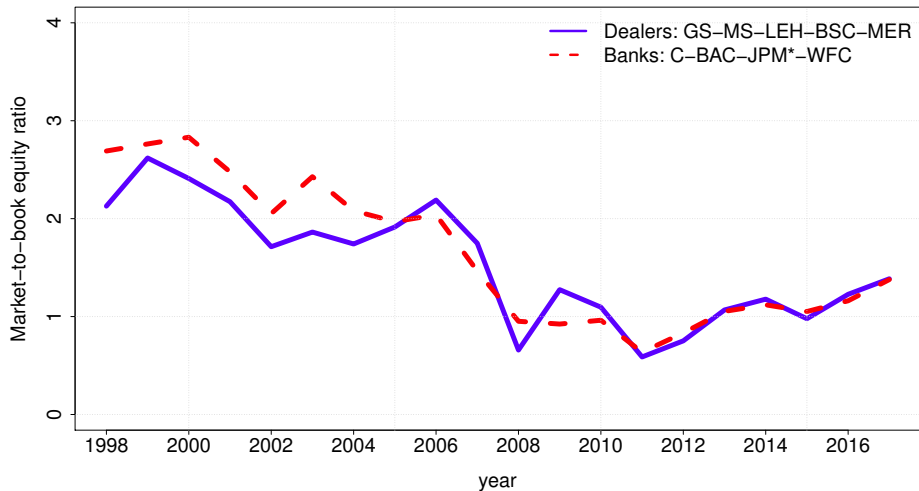
Red: Counterfactual $(\pi_{\text{pre}}^G, \pi_{\text{post}}^G) = (0.65, 0.65)$

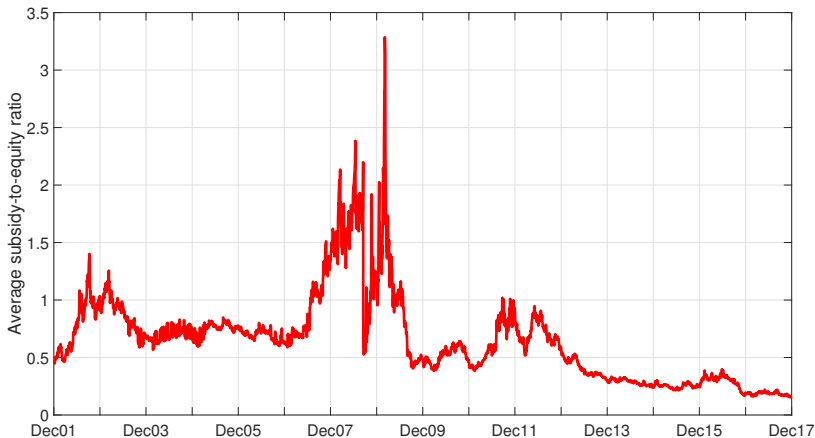# Total tangible assets of the largest U.S. banks

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