The Decline of Too Big to Fail

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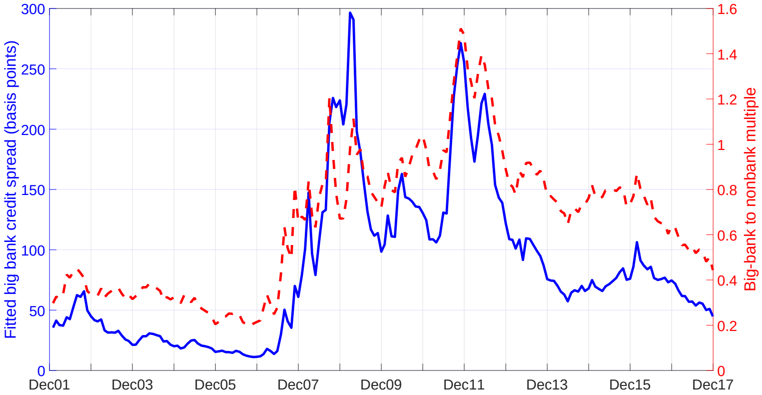
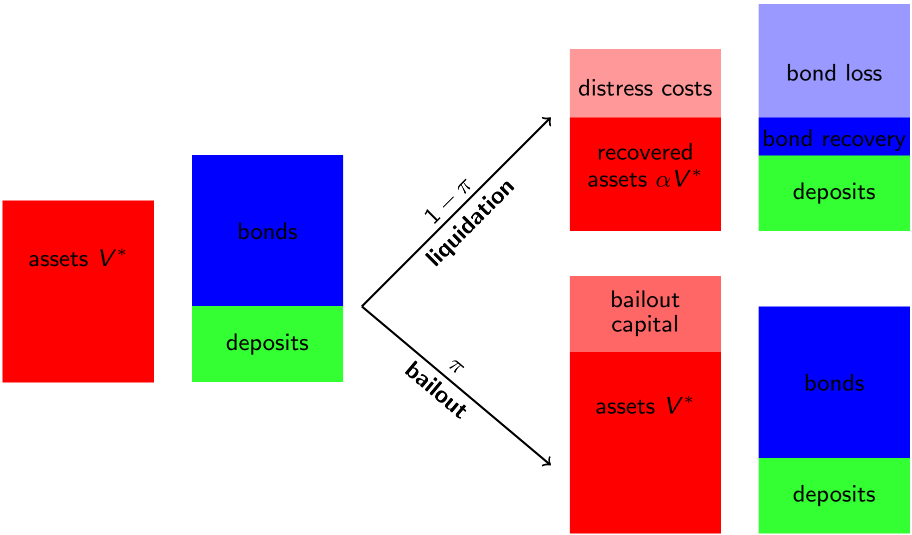
Big-bank credit spreads much higher after the crisis



Blue: Big-bank CDS rates at fixed standard controls for insolvency risk

Red: Big-bank to nonbank relative month multiplier

Why? — Bank credit risk subject to government bailout



Motivation and main objective

- Crisis revelations of costs of "too-big-to-fail" have lead to new legal methods for resolving the insolvencies of big banks
- Rather than bailing out these firms with government capital injections, insolvency losses are now supposed to be allocated to wholesale creditors
- Effectiveness of regulators' post-Lehman G-SIB failure-resolution intentions would imply lower likelihood of bailout—a drop in π
- **Main objective**: Quantify change in bailout probabilities π
- Our demarcation point for measuring π is Lehman's default in September 2008

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 relationship $S = p\,(1-\pi)\,L$ 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

- Thus, we fit a model of the form

$$\log \frac{S_{it}}{1-\pi_{it}} \;=\; \alpha + \beta d_{it}(\pi_{it}) + \text{Controls}_{K(i),t} + \varepsilon_{it}$$

Data-consistent bailout probabilities

- G-SIBs: $\pi_{it} \in \{\pi^G_{pre}, \pi^G_{post}\}$. D-SIBs: $\pi_{it} \in \{\pi^D_{pre}, \pi^D_{post}\}$.

- Using daily CDS rates over 2002–2017, for almost 800 public U.S. firms including 8 G-SIBs, we estimate

$$\log \frac{S_{it}}{1-\pi_{it}} = \alpha + \beta\, d_{it}(\pi_{it}) + \sum_{\text{sectors } j} \delta_j\, D_j(i) + \sum_{\text{mos } m} \delta_m\, D_m(t) + \sum_{\text{mos } m} \delta^G_m\, D_m(t)\, D^G(i) + \sum_{\text{mos } m} \delta^D_m\, D_m(t)\, D^D(i) + \varepsilon_{it}$$

- **Identifying assumption**:

$$\overline{\delta}^G_{\text{post}} - \overline{\delta}^G_{\text{pre}} = \overline{\delta}^D_{\text{post}} - \overline{\delta}^D_{\text{pre}} = 0$$

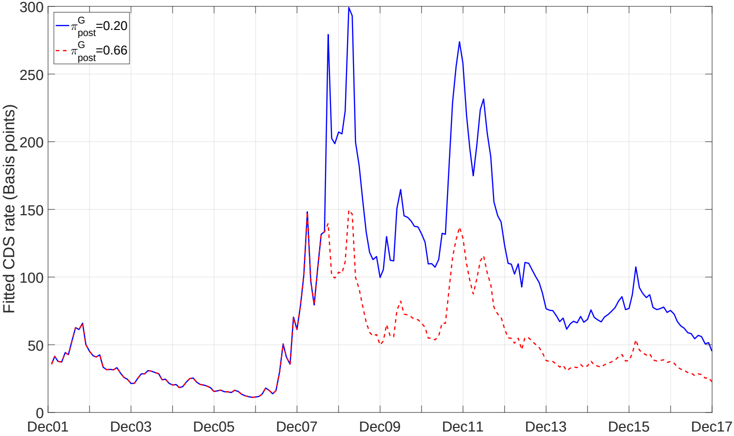
- This yields data-consistent pairs $(\pi^G_{pre}, \pi^G_{post})$ and $(\pi^D_{pre}, \pi^D_{post})$

Calibration results

π_{post}	π^G_{pre}	π^D_{pre}
0.30	0.70	0.54
0.20	0.66	0.41
0.10	0.62	0.38
0.00	0.58	0.34

- Results are robust to a range of model assumptions regarding the valuation of bank assets with bailout subsidies
- Model assumptions impact the function form of $d(\pi)$. For a given π, $d(\pi)$ is calibrated to observed market values of debt and equity

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



Blue: Based on fitted $(\pi^G_{\text{pre}}, \pi^G_{\text{post}}) = (0.66, 0.2)$

Red: Based on counterfactual $(\pi^G_{\text{pre}}, \pi^G_{\text{post}}) = (0.66, 0.66)$

Valuation of bank assets with bailout subsidies

- Leland (1994 WP) + 2 classes of debt + insured deposits + possibility of nationalization at insolvency
- We consider a bank whose assets in place, V_t, satisfy

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

  under risk-neutral measure

- Default happens the first time τ assets reach boundary V^*
- At τ, bank is either bailed out or liquidated. Bailout is not predictable and occurs with probability π
- If bailed out, bank receives capital injection $\widehat{V} - V^*$ that returns market value of bonds to B. Government becomes equity owner
- Model can be solved using endogenous V^* chosen by shareholders to maximize market equity, or exogenous liquidation recovery rates

Bank cash flows

Unlevered firm	$y_0(x)$	$=$	x
Distress costs	$y_1(x)$	$=$	$U_r(x)\left[(1-\pi)\,(1-\alpha)V^* + \pi\, y_1(\widehat{V})\right]$
Tax shields	$y_2(x)$	$=$	$\kappa\frac{cP+dD}{r}\,(1-U_r(x)) + U_r(x)\,\pi\, y_2(\widehat{V})$
Bailout subsidy	$y_3(x)$	$=$	$U_r(x)\,\pi\left[\widehat{V} - V^* + y_3(\widehat{V})\right]$
Deposit insurance	$y_4(x)$	$=$	$U_r(x)\left[(1-\pi)(D-\alpha V^*)^+ + \pi\, y_4(\widehat{V})\right]$
Asset rents/costs	$y_5(x)$	$=$	$\frac{\phi}{k}\,[x - U_r(x)V^*] + U_r(x)\,\pi\, y_5(\widehat{V})$
Total	$Y(x)$	$=$	$y_0(x) - y_1(x) + y_2(x) + y_3(x) + y_4(x) + y_5(x)$

Claims on bank cash flows

Equity holders	$H(x)$		
Depositors	$v_1(x)$	$=$	$D\frac{d}{r}(1-U_r(x))+U_r(x)\left[\pi v_1(\widehat{V})+(1-\pi)D\right]$
Bond holders	$v_2(x)$	$=$	$P\frac{c+m}{r+m}(1-U_{r+m}(x))$
			$+\,U_{r+m}(x)\left[\pi B+(1-\pi)(\alpha V^*-D)^+\right]$
Government	$v_3(x)$	$=$	$U_r(x)\,\pi\left[H(\widehat{V})+v_3(\widehat{V})\right]$
Total	$H(x)+v_1(x)+v_2(x)+v_3(x)$		

Bank cash flows = Claims on bank cash flows

Equity holders	$H(x)$		
Depositors	$v_1(x)$	$=$	$D\frac{d}{r}(1-U_r(x))+U_r(x)\left[\pi v_1(\widehat{V})+(1-\pi)D\right]$
Bond holders	$v_2(x)$	$=$	$P\frac{c+m}{r+m}(1-U_{r+m}(x))$
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Government	$v_3(x)$	$=$	$U_r(x)\,\pi\left[H(\widehat{V})+v_3(\widehat{V})\right]$
Total	$Y(x)$	$=$	$H(x)+v_1(x)+v_2(x)+v_3(x)$

Market value of equity

Equity holders	$H(x)$	$=$	$Y(x) - v_1(x) - v_2(x) - v_3(x)$
Depositors	$v_1(x)$	$=$	$D\frac{d}{r}(1 - U_r(x)) + U_r(x)\left[\pi v_1(\widehat{V}) + (1-\pi)D\right]$
Bond holders	$v_2(x)$	$=$	$P\frac{c+m}{r+m}(1 - U_{r+m}(x))$
			$+ U_{r+m}(x)\left[\pi B + (1-\pi)(\alpha V^* - D)^+\right]$
Government	$v_3(x)$	$=$	$U_r(x)\,\pi\left[H(\widehat{V}) + v_3(\widehat{V})\right]$
Total	$Y(x)$	$=$	$H(x) + v_1(x) + v_2(x) + v_3(x)$

Model allows computation of comparative statistics

- Hypothetical reduction in π^G_{pre} from 0.66 (estimated level) to 0.2 (assumed post-Lehman level) results in 55% drop in G-SIB equity market value

- In that sense, 45% of the equity market value of G-SIBs, on average during the pre-Lehman period, can be ascribed to bailout-subsidized debt financing costs

- On average in pre-Lehman period, roughly 2/3 of market value of future bailout subsidies is associated with the next bailout

- At fixed DtD, reduction in π^G from 0.66 to 0.2 implies post-Lehman senior unsecured yield spreads that are roughly twice what they would have been had there been no decline in π

Data

Table: **Distribution of firms across sectors and by median credit quality.**

	Aaa	Aa	A	Baa	Ba	B	Caa	Ca-C	All
Basic Materials	0	0	11	19	15	6	0	0	52
Consumer Goods	0	3	15	48	25	17	7	0	118
Consumer Services	0	2	12	45	21	24	12	2	123
Energy	1	1	6	38	12	15	1	1	78
Financials	1	10	29	59	8	4	0	0	119
Healthcare	1	1	10	21	10	6	1	0	57
Industrials	1	3	18	35	18	12	4	0	97
Technology	1	2	10	15	5	10	1	0	54
Telecommunications	0	0	5	7	4	5	3	0	26
Utilities	0	0	8	33	7	7	1	0	59
All	5	22	124	320	125	106	30	3	783

Related Work

- Large empirical literature on TBTF subsidies, but only few studies address the degree of post-crisis decline in TBTF subsidies
- Atkeson, d'Avernas, Eisfeldt, and Weill (2018): Large drop in post-crisis market-to-book ratios for banks due to TBTF
- Haldane (2010): Estimates reduction in TBTF subsidies associated with post-crisis reduction in sovereign rating uplifts of big banks
- Acharya, Anginer, and Warburton (2016): No significant impact on G-SIB CDS rates within 60 days of the passage of Dodd-Frank
- No prior studies estimate post-crisis changes in bailout probabilities

Competing stories

1. High post-crisis credit spreads of large U.S. banks reflect high post-crisis levels of default risk (Sarin and Summers (2016), Chousakos and Gorton (2017))

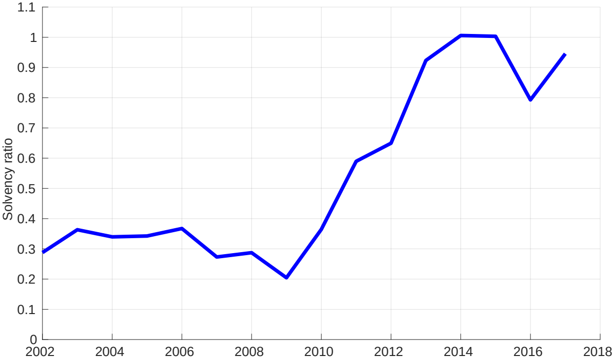

Figure: **Solvency ratios of the largest U.S. banks.** Tangible equity divided by an estimate of the standard deviation of the annual change in asset value

Competing stories

1. High post-crisis credit spreads of large U.S. banks reflect high post-crisis levels of default risk (Sarin and Summers (2016))
2. Higher post-crisis credit spreads of large U.S. banks because before the crisis creditors had little awareness that big banks could actually fail (Gennaioli and Shleifer (2018))
   - Behavioural story which relies on changes in *perceived likelihood of insolvency*
   - Story implies that the crisis-induced increase in the perception of bank failure risk persisted for some years after the crisis
   - Historically, not aware of previous financial crises where a large jump in wholesale big-bank credit spreads persisted well beyond that crisis

Conclusion

- For G-SIBs with U.S. headquarters, we find large post-Lehman reductions in market-implied probabilities of government bailout
- These reductions are associated with big increases in debt financing costs for G-SIBs, after controlling for insolvency risk
- Data are consistent with significant effectiveness of post-Lehman G-SIB failure-resolution intentions, laws and rules
- G-SIB creditors now appear to expect to suffer much larger losses in the event that a G-SIB approaches insolvency
- In this sense, we estimate a major decline of "too big to fail"