The Decline of Too Big to Fail

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Big-bank credit spreads got much higher after the crisis

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
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."


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

Balance sheet at insolvency
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

\[ \text{assets } V^* \]

\[ \text{bonds} \]

\[ \text{deposits} \]

\[ 1 - \pi \text{ bankruptcy} \]

\[ \pi \text{ bailout} \]

\[ \text{distress costs} \]

\[ \text{recovered assets } \alpha V^* \]

\[ \text{bond loss} \]

\[ \text{bond recovery} \]

\[ \text{deposits} \]

\[ \text{bailout capital} \]

\[ \text{assets } V^* \]

\[ \text{bonds} \]

\[ \text{deposits} \]
Conditional on no bailout: bankruptcy or bail-in

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 \( \delta V_t \), 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.
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


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)

Fitting post-crisis reductions in bailout probabilities

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

\[ \pi_{it} = \pi_{\text{pre}}, \quad \text{pre crisis} \]
\[ = \pi_{\text{post}}, \quad \text{post crisis}. \]
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- Because big-bank LGD is hard to estimate, we cannot pin down both \( \pi_{\text{pre}} \) and \( \pi_{\text{post}} \), so we estimate \( \pi_{\text{pre}} \) for stipulated \( \pi_{\text{post}} \).

  - 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

<table>
<thead>
<tr>
<th>$\pi_{\text{post}}$</th>
<th>$\pi^G_{\text{pre}}$</th>
<th>$\pi^D_{\text{pre}}$</th>
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Fitted CDS rates for G-SIBs at distance to default of 2

Blue: Based on fitted \((\pi^G_{\text{pre}}, \pi^G_{\text{post}}) = (0.63, 0.2)\)

Red: Based on counterfactual \((\pi^G_{\text{pre}}, \pi^G_{\text{post}}) = (0.63, 0.63)\)
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.
For $\pi_{\text{post}} = 0.2$ and fitted $\pi_{\text{pre}} = 0.65$, average of BoA, MS, C, JPM, GS, BNYM, WF.