Too-Systemic-To-Fail

What Option Markets Imply About Sector-wide Government Guarantees

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Managing Tail Risk

- governments and central banks have a large footprint in asset markets
- govts/central banks actively manage tail risk:
  - use their balance sheet to preemptively eliminate tail risks that are deemed to pose an unacceptable risk to the financial system or the economy at large
  - commitment to use their balance sheet in case of a tail event
- drives a wedge between fundamental value of assets and their market value, especially for those assets that are sensitive to tail risks

Central Bank Put Bubble

In the midst of the global financial crisis, the Fed aggressively injected emergency liquidity and intervened to fix disrupted and malfunctioning markets. In the process, it rescued investors from what would have been irrecoverable losses.... On several other occasions, the Fed acted to counter the disruptive "left tail" of deflation and recession.

The Federal Reserve remains the best friend of many investors. It is among several key western central banks that are supporting asset prices not as an end in itself but as a means to promote growth and jobs...

Essentially, the Fed is inserting a sizeable policy wedge between market values and underlying fundamentals.

Mohamed El-Erian in FT, October 10, 2012.

Measuring Distortions

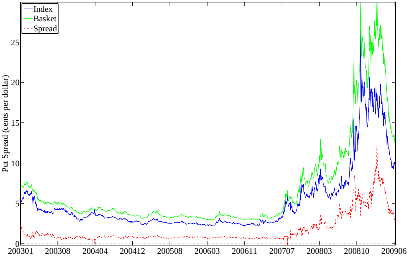
- Wedges: affect creation and allocation of risk in the economy
- Focus on **options** on **financial** stocks, because
  - options are highly sensitive to tail events
  - policymakers have low tolerance for these systemic tail events in financial sector
- We find direct and indirect evidence in option prices that government is subsidizing tail risk for bank shareholders
- Subsidy to equity holders averages \$50bn during the August 2007-March 2009 period. Makes financial sector tail risk insurance 50% too cheap.

Puzzling Crisis Facts: Missing Aggregate Tail Risk

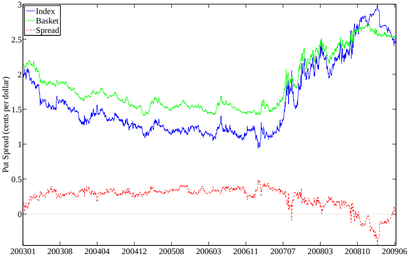
- Crisis an episode of elevated systemic risk
- Correlations among financials increase sharply
- When correlations rise, one expects the difference between the price of basket of put options on all financial stocks and the price of a put option on the financial sector index to shrink
- Surprisingly, we find that this put spread **rose** substantially during the crisis instead.
- Financial sector crash insurance surprisingly cheap
- Specific to financial sector and specific to puts

Basket-Index Put Spread

Panel A: Puts



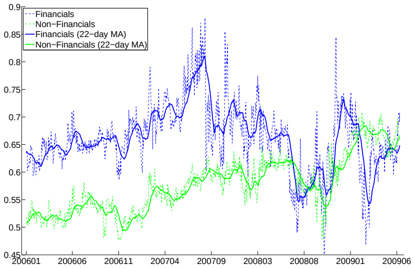
Panel B: Calls



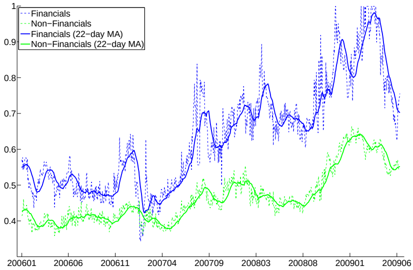
*Moneyness $|\Delta| = 20$ for individual and index options; *TTM* = 365 days.

A different metric: Option-implied Correlations

Panel A: Put-Implied Correlation



Panel B: Call-Implied Correlation

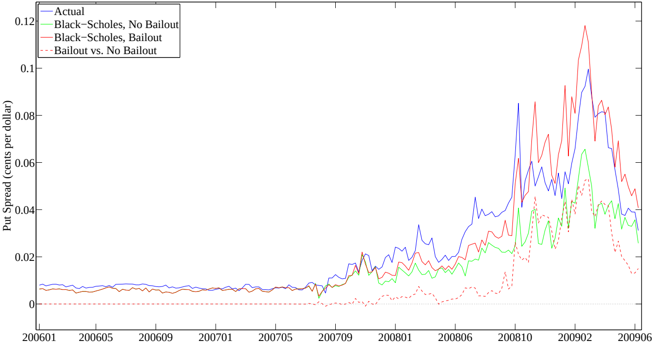


*Moneyness $|\Delta| = 20$ for individual and index options; *TTM* = 365 days.

A Bailout Guarantee?

- Evidence: financial index puts cheap due to **collective bailout guarantee** for financial sector
- Indirect evidence:
  - Model without bailout (but rich volatility dynamics) cannot generate a simultaneous increase in basket-index put spread and return correlations
  - Model with bailout can (government truncates return distribution at a 35% loss)
- Direct evidence: put spread highly sensitive to government announcements
  - TALF announcement: in 5-day window around announcement (03/03/09), put spread doubles
  - Large decline when announced that TARP will be equity injections instead of toxic asset purchases (10/14/08)

Bailout model-implied Basket-Index Put Spreads

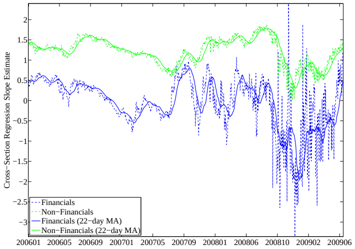


$|\Delta|$ is 20. Time to maturity is 365 days.

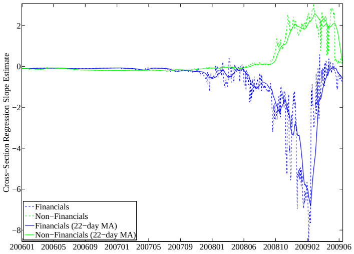
Across Banks: Too-Big-To-Fail

- If there is heterogeneity in likelihood of being bailed out in crisis, then prices of crash insurance should differ across banks.
- Cross-sectional regression of OTM put prices for financial firms, relative to Black-Scholed model, on market size, controlling for leverage
- Same regression for CDS rates for financial firms, relative to Merton model, on market size

Panel A: Options



Panel B: CDS



Take-Aways

- Option markets indicate that government protected shareholders in banks during the crisis by offering a collective bailout guarantee,
- Quantitatively meaningful: implicit subsidy of $50bn a day, making tail risk insurance on sector 50% too cheap during crisis
- Naturally benefitted large banks more than small banks (option prices and CDS rates agree)
- No normative judgement: may be the right thing to do, may cause moral hazard ex-ante
- Methodology: when market participants anticipate government intervention, market prices are distorted. That makes systemic risk measures based on market prices treacherous terrain
    - Basket-index put spread: Absent guarantees, it should decline in crisis times, but in fact it rose dramatically!