A New Capital Regulation For Large Financial Institutions

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Motivations

- The 2008 financial crisis has
  - exposed size of the too-big-to-fail problem
  - worsened the moral hazard it engenders.
- The large – small difference in interbank rates dropped from -8 bps to -34 bps (Cho, 2009).
- This induces LFIs to borrow more increasing
  - the risk of the system
  - the cost of the eventual bailout.
- It also distorts competition increasing the number and size of the banks that would need to be rescued in the future.

What Is Special About LFIs?

- In the bankruptcy of any firm there are two effects:
  - Substitution: if one competitor goes under the others do better
  - Complementarity: if one competitor goes under the others do worse
- In the financial sector, two factors exaggerate the complementarity:
  - A lot of interconnected contracts
  - Psychological element in bank's run

Goal

- The goal of regulation is to preserve the incentive effects of bankruptcy while

1) avoiding at all costs that the LFI is insolvent with respect to its systemic obligations.

2) Conditional on this goal being reached,

i) minimizing the probability other obligations suffer a loss

ii) making intervention as painless as possible to minimize the “psychological costs”

Result

We design a mechanism where

1) in equilibrium there will not be default

2) even out of equilibrium the systemic obligations are paid in full

3) the differentiated procedure minimize the contagion effects

While much of the incentives effect of debt and of bankruptcy are preserved

Intuition

- Our mechanism mimics the way margin calls function.
- LFIs will post
  - enough collateral (equity) to ensure that the debt is paid in full with probability one.
  - enough non systemic debt to ensure that the systemic debt is paid even out of equilibrium
- When the fluctuation in the value of the underlying assets puts debt at risk, LFI equityholders are faced with a margin call and they must either inject new capital or lose their equity in the bank.

Intuition -2

- 2 differences with the margin calls:

1) Trigger mechanism: based on the CDS price

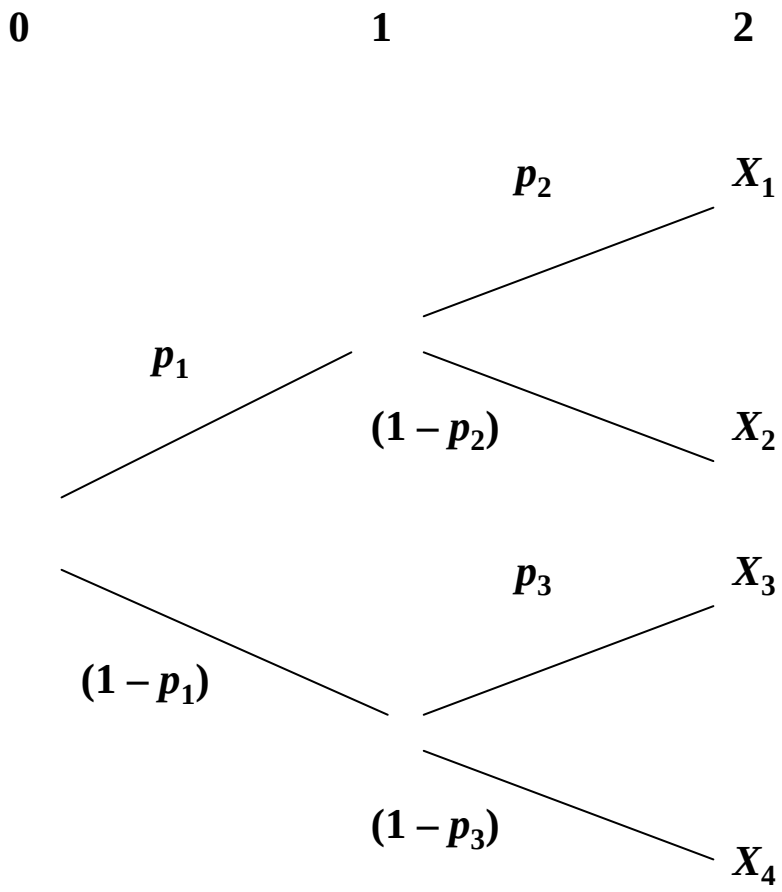
2) Resolution mechanism: If equity is not issued, regulator verifies the value of the firm and
   - If debt is not at risk, he infuse some funds
   - If debt is at risk, he fires the manager and appoint a receiver.

Outline

1. Simple capital structure model
2. Optimal capital structure when the states of the world are verifiable
3. Optimal capital structure when the states of the world are not verifiable
4. How this rule would have worked
5. Compare with the cost of alternatives

1) The Model

- To model the agency benefits of debt we assume that the LFI manager can “steal” a fraction λ of the cash flow available after having paid down the debt.
- Idea: managers can pay themselves large bonuses as long as the firm does not become insolvent afterwards.
- A two-period model with the following structure


0
1
2
p_2
X_1
p_1
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X_2
p_3
X_3
$(1-p_1)$
$(1-p_3)$
X_4

- For the time being, if we set the level of systemically relevant obligations, which arises from operational decision, equal to *SD*, we can rewrite the net cash flow of the firm as

$$V_i = X_i - SD_i$$

where $V1 > V2 > V3 > V4$.

- In our model the firm's capital structure consists of a choice of long-term debt D due at time 2

Assumptions

- Capital structure is set in a value maximizing way at time zero
- At time 1, the LFI manager can modify the capital structure by issuing equity only if he has shareholders' approval.
- At time 2, the company pays out the cash flow V and terminates.
- The market is risk neutral, and the interest rate is zero.

In the absence of any debt, the market value of the LFI (which we label V^U, i.e., value of the unlevered firm) would be

$$V^U = (1-\lambda)[p_1 p_2 V_1 + p_1(1-p_2)V_2 + (1-p_1)p_3 V_3 + (1-p_1)(1-p_3)V_4].$$

If we introduce a debt D such that $V_4 < D < V_3$, then the market value of the debt V^D at issue will be total value of the levered LFI (V^L) will be

$$V^L = V^U + \lambda[p_1 p_2 + p_1(1-p_2) + (1-p_1)p_3]D + \lambda(1-p_1)(1-p_3)V_4.$$

The Unregulated Outcome

- Since there is a benefit, but not a cost, of debt, the value of a LFI is monotonically increasing in the level of debt.
- An unregulated value-maximizing LFI will pick a debt level that would lead to bankruptcy with probability one.
- A regulator could impose a debt level less than or equal to V_4.
- This would eliminate the systemic risks, but impose a high cost for the LFI.
- Can we do better with a contingent capital structure?

The Regulated Outcome

- Consider a time-zero debt level D such that $V_4 < D < V_3$.
- At time 1, if the realization is good -> debt not at risk
- If the realization is bad, then debt becomes risky => LFI receives a margin call, i.e., it is forced to raise more equity.
- The LFI must raise $y \equiv D - V_4$.

The Regulated Outcome -2

By diluting the entire value of existing equity, LFI can raise

$$p_3(1-\lambda)(V_3 + y - D).$$

Hence feasibility requires

$$p_3(1-\lambda)(V_3 + y - D) \geq y,$$

which implies that for a debt level *D* to be made riskless through a margin call it must satisfy

$$D \leq V_4 + p_3(1-\lambda)(V_3 - V_4).$$

The Regulated Outcome -3

- LFI value

$$V^L = (1-\lambda)[p_1 p_2 (V_1 - D) + p_1 (1-p_2)(V_2 - D) + (1-p_1) p_3 (V_3 + y - D)] + D - (1-p_1) y$$

Substituting the value of *y*, we obtain

(1) $$V^L = V^U + p_1 \lambda D + (1-p_1)\lambda V_4.$$

- Since (1) is increasing in *D*, it will be optimal for the LFI to set *D* at the maximum level compatible with the financing constraint.
- Substituting in (1) and rearranging we obtain:

(2) $$\hat{V}^L = V^U + \lambda V_4 + \lambda p_1 p_3 (1-\lambda)(V_3 - V_4).$$

Intuition

- Debt prevents managerial stealing.
- Since there is at least V_4 in debt, the second term (V_4) represents the stealing prevented in all states of the world.
- With probability p_1, the higher debt level remains in place and will prevent some further stealing.
  - How much? $\lambda p_3(1-\lambda)(V_3 - V_4)$
  - With what probability? p_1
- With probability $(1 - p_1)$ at time 1, we find ourselves in the lower branch of the tree.
  - debt level must be brought down to V_4 to avoid default, there is no additional stealing prevented.

Implications

Equation (2) provides intuition for when contingent capital structure makes LFI more valuable.

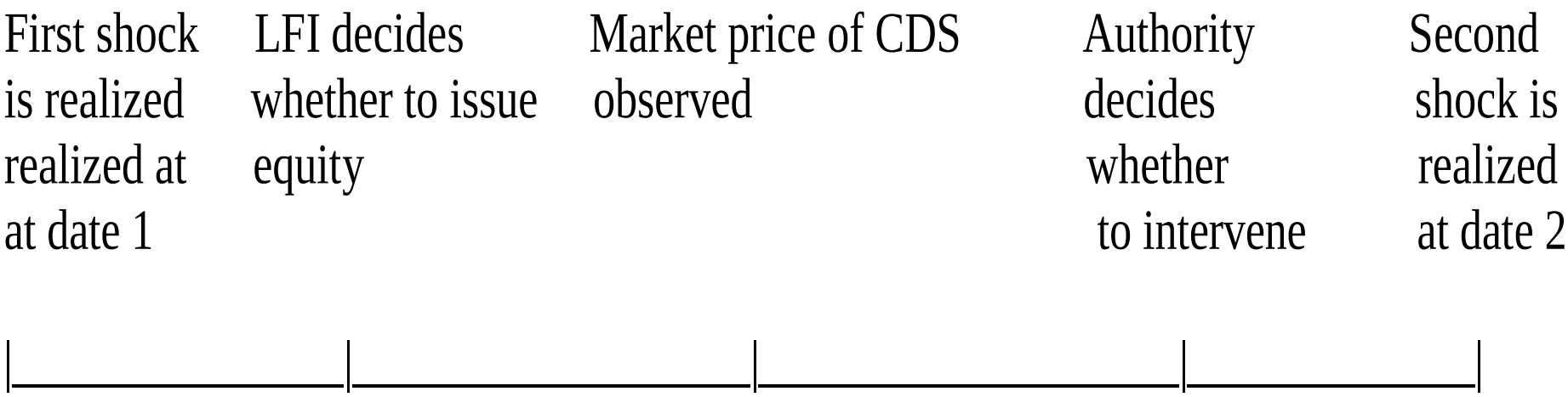
- $(V_3 - V_4)$ = volatility of underlying assets =>the higher the volatility, the higher is the gain
- For a low level of agency costs λ $(\lambda < 1/2)$, the larger the size of the agency problem, the larger is the gain
- For a high level of agency costs, relationship inverted extra borrowing limited by difficulty of raising equity.
- Finally, a contingent capital structure is more preferable the more likely is the good-case scenario (i.e., the higher p_1 and p_3 are).

States of the World Not Verifiable

- We study a “margin requirement” type of mechanism
  - When the margin is called?
  - What happens if the margin call is not answered
- Trigger mechanism: CDS
- Rule: if new equity is not raised (or is not raised in a sufficient amount), the regulator will intervene.
  - Determines whether the debt is at risk; if not he inject some funds in the form of pari passu debt
  - If the debt is at risk he replaces the CEO with a receiver and reorganize the company imposing a haircut on creditors.

Timing

Figure 1: Timing



Key Result

Proposition 1: Assume $D \leq V_4 + p_3(1-\lambda)(V_3 - V_4)$. Then the equilibrium price of a CDS, p_{CDS} will be greater than zero if and only if the lower branch of the tree is followed and the LFI raises equity with value less than $D - V_4$ at date 1.

Proof:

A) Suppose lower branch and LFI raises less than $D - V_4$ in equity => it cannot be a rational expectations equilibrium for the regulator not to intervene: there is a positive probability that the debt will not be paid at date 2, and the CDS price will reflect this.

- Suppose instead that market expects regulator to intervene.
- The regulator will find that the LFI is under-capitalized and so he will reorganize imposing creditors a haircut => the CDS price will be positive.
- Thus the unique rational expectations equilibrium is for the CDS price to be positive and for the regulator to intervene.

B) Lower branch and LFI raises equity equal to $D - V_4$. If the regulator intervenes he will find that the debt is not at risk, and so he will do nothing. The debt is also not at risk if the regulator does not intervene. Thus the unique rational expectations equilibrium in this case is for the CDS price to be zero and for the regulator not to intervene.

C) Upper branch of the tree is followed. Then the debt is not at risk, and so the unique rational expectations equilibrium is one where the CDS price is zero and the regulator does not intervene.

Resolution Mechanism

- Haircut is imposed to make CDS market viable.
- The injection of funds is designed to
  - Make it politically costly to say that the LFI debt is not at risk
  - Protect systemic relevant contracts (which are senior) from the regulator's mistake
- Political cost maximized by making the government claim junior to financial debt
- But we want to prevent that the government has an easy way to bailout firms for fears that it will abuse of this privilege -> debt senior
- Pari passu debt strikes the right balance.
- If the firm is insolvent pari passu debt does bail out the existing creditors, but it is sufficiently junior to make the government suffer some pain.

Resolution Mechanism -2

- We assumed that the receiver
  - wipes out the initial equity and debt;
  - puts in place a new value-maximizing capital structure that avoids future bankruptcy;
  - sells the LFI expeditiously;
  - distributes the proceeds to former creditors, ensuring that creditors are not fully repaid.
- An alternative would be to have the receiver force a debt for equity swap.
- But more difficult to impose a haircut on creditors.

Systemic vs. non systemic debt

- In our formal model we will not distinguish between the private motives for issuing systemic and non-systemic obligations.
- From a social point of view, while defaulting on either kind of obligation is costly, defaulting on a systemic obligation is much more costly.
- Reason for the regulator to intervene.

Double Layer

- If mechanism works perfectly, no problem even if 100% of debt is systemic.
- If concerned about an “out of equilibrium” events, then
  a) limit fraction of total debt that is systemic;
  b) make the systemic debt senior.
- Junior long- term debt has also the function of supporting the CDSs.

Could a trigger strategy rely on short term debt?

- If initial capital structure has a *STD*

$$V_4 < STD \leq p_3 V_3 + (1 - p_3) V_4$$

- then STD can always be refinanced at time 1, but the rate at which it is refinanced will provide an indication of the probability of bankruptcy.
- In the model any rate above zero will suggest a possibility of bankruptcy.
- If initial capital structure has a *STD*

$$STD > p_3 V_3 + (1 - p_3) V_4$$

then the LFI would be unable to refinance the short term debt if it faces a negative shock at time 0 and will go into bankruptcy with probability one at time 1

Why the CDS?

- CDS is where price discovery first occurs
  - It leads the stock market (Acharya and Johnson, 2007), the bond market (Blanco et al, 2005) and even the credit rating agencies (Hull et al, 2004).
- Equity no good because
  - Affected by the upside
  - Multiple equilibria
- Other debt-like instruments (bonds, yield spreads) good as long as
  - Liquid
  - Not easy to manipulate
  - Easily observable

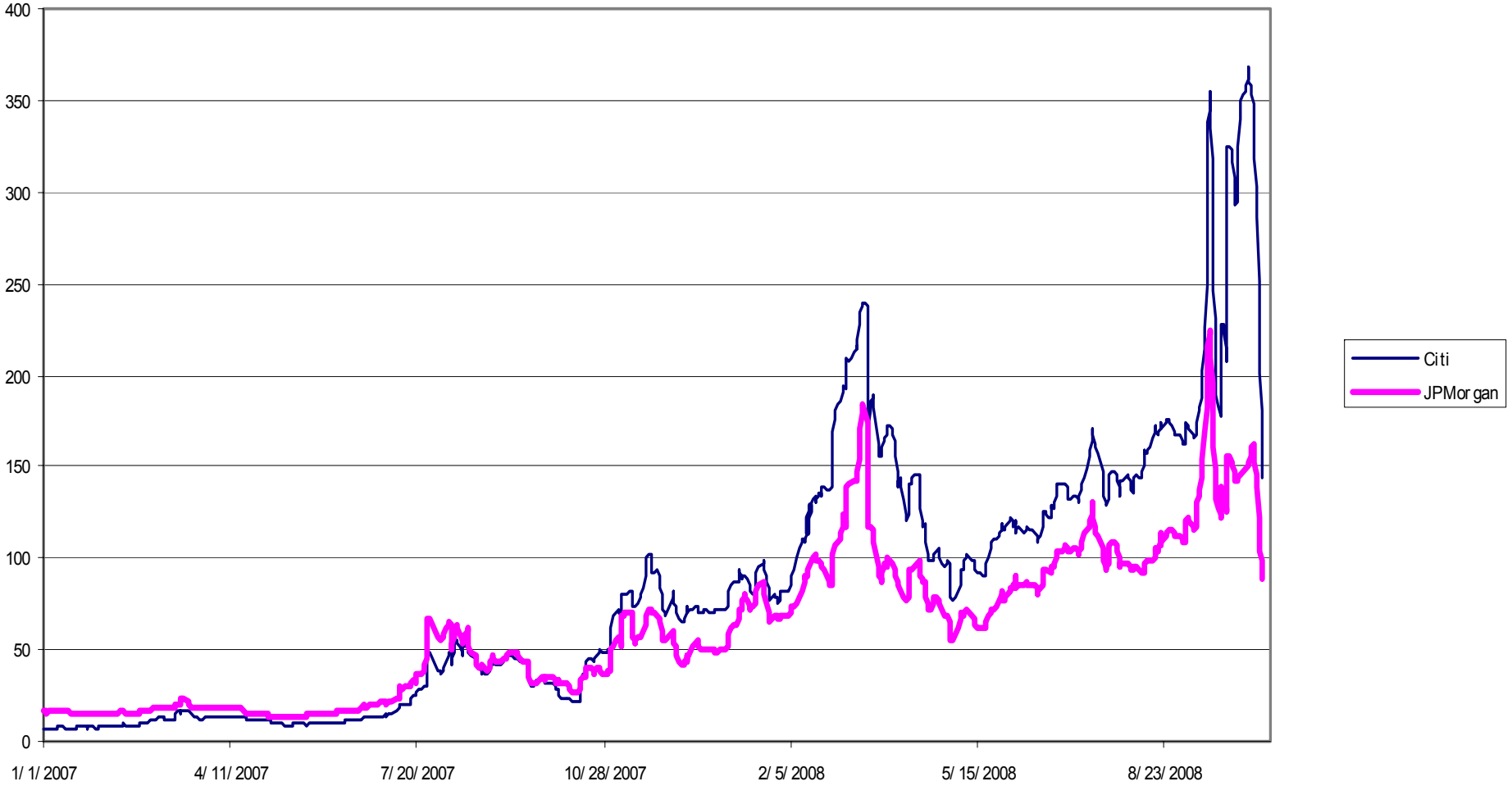
A Manipulation-Proof Rule

- Trigger = whenever the CDS price is above 100 bps for at least 20 of the last 30 trading days.
  - haircut imposed on creditors = 20%.
  - Regulator has a false positive =5%
- Speculator will be unwilling to drive the CDS price over 100 bps because on average he will lose out.
- If the mechanism is triggered,
  - with .95 probability the LFI is declared solvent and the CDS price will drop to zero,
  - with .05 probability the company is declared insolvent and a 20% haircut is imposed on the bondholders, with the CDS paying 2000 basis points.
- Since the CDS expected value = 100, it does not pay speculators to drive the price above 100.

Would This Rule Have Worked?

- Bear Stearns and Washington Mutual would have triggered this rule in August and September 2007.
- Citigroup in February 2008
- Wells Fargo, BoA, JPMorgan in July 2008

Citi and JP Morgan CDS prices leading to the crisis



Washington Mutual CDS prices before receivership

Commitment Mechanism

- Too-big-too-fail is mainly a political economy problem: faced with the trade off
  - Bankruptcy costs vs. distortion in the ex ante incentives,
- even a benevolent government will be biased in favor of the bailout.
- By forcing regulator to take a decision earlier (when restructuring costs lower), our mechainsm reduces the bias.

Does It Help to Avoid Systemic Crisis?

- 3 reasons why an LFI failure has systemic effects:

1) Losses on the credit extended to the insolvent LFI can make other LFIs insolvent.
   - Our mechanism eliminates this problem

2) The failure of an LFI can force assets liquidation leading to downward spiral in assets prices
   - Our mechanism does not force any asset liquidation, thus avoiding a downward spiral in assets prices.

3) LFI failure reduces financial and human resources dedicated to trading certain assets classes.
   - Our mechanism increases the amount of capital invested in the sector, alleviating the shortage which is at the root of many crises.

Comparison with the Literature

- Main difference w.r.t. Kashyap et al. (2008) is

1) mechanism to make certain states of the world verifiable:
   - CDS prices vs. an aggregate industry profits.
2) resolution mechanism built in

- Kashyap et al. (2008) limit the injection of capital to situations of systemic crisis.
- If this is a virtue, our mechanism can easily be modified to achieve the same objective: We can condition intervention not just on the CDS price of the institution at play, but also on the

Conclusions

- The too-big-to-fail problem arises from a combination of
  - an economic problem : cost of bankruptcy on systemic obligations it very large
  - a political economy problem: time inconsistency induces the government/regulator to sacrifice the long-term effect to avoid the short-term costs
- Our mechanism addresses both these problems.
- It is similar to existing capital requirements:
  - two layers of protections for systemic obligations: equity capital and junior long-term debt.

Conclusions -2

- It differs in
  - trigger mechanism (based on CDS)
  - resolution mechanism.
- This mechanism ensures that LFIs are solvent with probability one, while preserving the disciplinary effects of debt.
- Credit default swaps have been demonized as one of the main causes of the current crisis. It would be only fitting if they were part of the solution.