# Basel III and Beyond.

## TAMING SIFIS

Xavier Freixas (UPF)
Jean-Charles Rochet (Zürich and TSE)

( Preliminary)

October 18, 2011

# 1. Introduction

The subprime crisis has reminded us that governments are often forced to bail-out large or complex banks,or other financial institutions like AIG, saving all its debtholders and even shareholders. In terms of cost benefit analysis, this may be the right or the unique option. We will refer to these institutions as **Systemically Important Financial Institutions** (SIFIs)

This Too Big To Fail situation can obviously induce these institutions to take excessive risks. The situation is even more dangerous than ever (see the Dodd Frank Act in the US).

With the exception of the radical proposal of Admati et al. (2010), traditional regulatory tools (mainly capital requirements) are not well adapted to cover extreme losses: huge amount, very small probability.

The complexity of the problem we address comes from the difficulty to write down the contracts between the regulatory authorities and the bank's managers. This is a cascading three agents incentives problem.

Two contracting levels:

Regulator designs a contingent contract that specifies the cash flows that shareholders and debholders will obtain if a crisis occurs.

Shareholders design the profit maximizing contract for the bank manager.

Bank manager maximizes its utility by choosing a level of risk.

Some (M.King) have argued that a TBTF is just too big and should be downsized. Others argue that complex institutions should be split into simpler parts (Volcker) or that some firewalls should be created (UK Independent banking commission). Some put forward new tools: Coco Bonds (Raviv 2004), Contingent Capital (Flannery 2005) Capital insurance (Kashyap, Rajan and Stein 2008), Systemic taxes,...

We show that this might not be sufficient to restore financial stability: Even if fairly priced capital insurance is necessary, it is not sufficient. The control of managers remunerations in the periods following extreme events (restructuring episodes) might be a necessary complement to classical regulatory instruments, combined with capital insurance.

# Motivation

Additional Motivation:Banks' payout policy
- Manager Compensation Packages
- Dividend Payout (Acharya, Gujral and Shin, 2009)

The Corporate Governance dimension : OECD vs Basel Committee rules

Limited liability and impact on banks' risk taking

# 2. Literature

Related to Systemic Risk to Taxes and Insurance:Kashyap, Rajan and Stein (2008),and to the internalization of the impact of SIFIs on systemic risk (Adrian and Brunnermeier "Covar", Acharya, Lasse, Philippon and Richardson "MES", Tarashev, Borio and Tsatsaronis (2008) Huang, Zhou and Zhu,

Bank closures and risk taking: Mailath Mester (1994), Kocherlakota and Shim (2007)

Repeated Moral Hazard in discrete time: Sannikov (2003), DeMarzo and Fishman (2008), Biais, Mariotti, Plantin and Rochet (BMPR 2004), Myerson (2009)

# 3. The Model

There is a single bank of fixed size, generating at each period ($t = 0, 1, \ldots$) a positive cash flow $\mu$.

With some(very)small probability $\lambda$ the bank may incur (very) large losses: the amount $C$ has to be injected, otherwise the bank is forced to shut down forever with a high cost to society. (This is our definition of a SIFI)

We assume that $\mu > \lambda C$. Investors are risk neutral, and have discount factor $\delta$.

We offer two alternative interpretations of this technology:

- derivative products like CDSs: the bank sells protection and receives at each period a premium $\mu$ but may be obliged to cover big credit losses if a credit event occurs;
- Classical transformation of deposits into a risky investment. The cash flow $\mu$ is then interpreted as the net return to investment, after interest paid to depositors. There is a small probability of a catastrophic loss on investment.

Absent moral hazard or other financial frictions, the expected net PV of the bank's activity (assuming that it continues forever) is $\frac{\mu-\lambda C}{1-\delta}$.

The source of the Too Big To Fail problem is that $\delta \frac{\mu-\lambda C}{1-\delta} < C$ banks' shareholders prefer to default in case of large losses.

Thus systemic events are characterized in our model by a very large impact $C$ but a very small probability $\lambda$. To prevent strategic default of the bank, which would inflict negative externalities on society, some form of compulsory insurance is needed, as in Biais, Mariotti, Rochet and Villeneuve (2008).

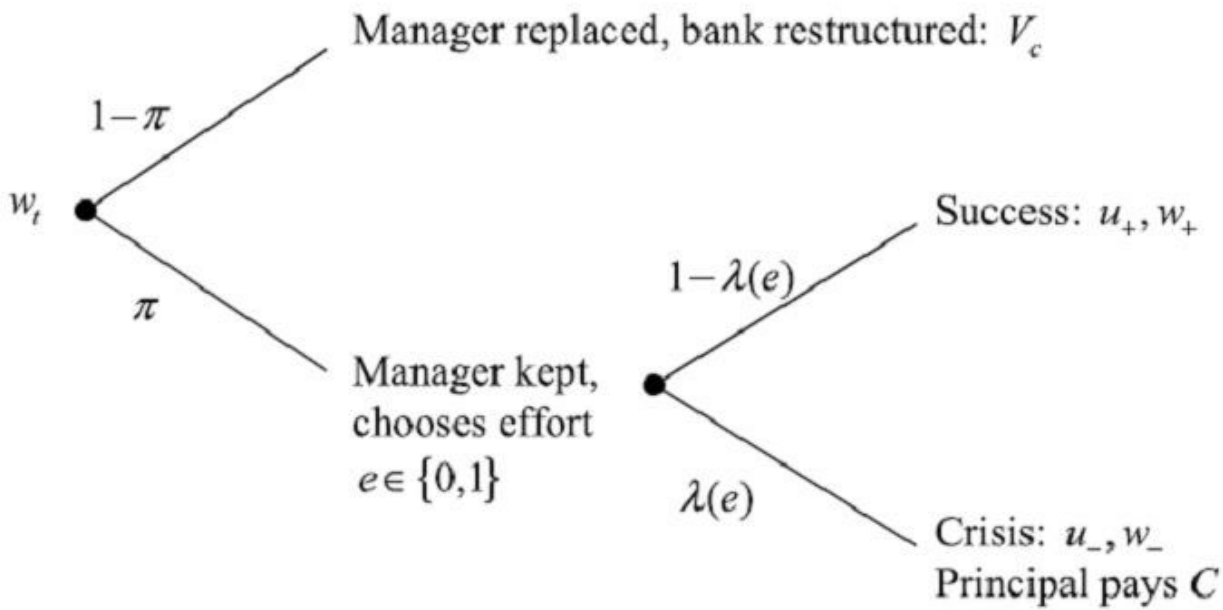
The bank has to be run by a manager. He can be selected among a pool of potential managers who are all identical: they are risk neutral and discount the future at rate $\delta_M < \delta$.

Managers don't have any initial wealth that could be pledged. They accept to manage the bank provided the bank' shareholders offer them expected discounted payments of at least $U$.

There is moral hazard: the manager can shirk (which provides private benefit $B$ per period) without being detected. In that case, the probability of a crisis is increased to $\lambda + \Delta\lambda$ per period, which is socially inefficient:

$$B < C\Delta\lambda.$$

The time line of events is represented as follows:



# 4. Optimal Contract

Following BMPR (2004), we adopt the standard recursive method used for solving repeated moral hazard problems.

The decisions specified in a contract are parameterized by the continuation pay-off of the bank manager (the agent), denoted $w$. The bank cannot be closed down or downsized, but the manager can be replaced at a certain cost.

## CLASS OF CONTRACTS

At the beginning of each period, the contract specifies (as a function of the agent's continuation pay-off $w$) the probability $1 - \pi(w)$ that the manager is replaced and the bank restructured.

With the complement probability $\pi(w)$, the manager continues and the contract specifies:

- the effort decision $e(w) \in \{0, 1\}$ of the manager (where $e = 0$ means shirking),
- current payments to the agent $u_+(w)$ and $u_-(w)$ conditionally on its performance (where $-$ denotes the occurrence of a crisis),
- the continuations pay-offs $w_+(w)$ and $w_-(w)$ promised to the agent after the current period, also conditionally on its current performance.

## OPTIMAL CONTRACT

The optimal contract is thus associated with the Bellman function $V$ that solves for all $w$

$$V(w) = \max \pi \left[ \mu - \lambda C + (\lambda \hat{V}(w_-) + (1-\lambda)\hat{V}(w_+)) \right] + (1-\pi)V_c$$

under the constraints

$$\begin{aligned} 0 \leq \pi \leq 1 & \\ (u_+ + \delta_M w_+) - (u_- + \delta_M w_-) \geq \frac{B}{\Delta\lambda} & \quad (IC) \\ \pi[\lambda(u_- + \delta_M w_-) + (1-\lambda)(u_+ + \delta_M w_+)] = w & \quad (PK) \\ u_+ \geq 0 \quad u_- \geq 0 \quad w_+ \geq 0 \quad w_- \geq 0 & \quad (LL) \end{aligned}$$

where $V_c$ is the social continuation value of a restructured bank, net of restructuring costs and:

$$\hat{V}(w) = \delta S(w) + \delta_M w = \delta V(w) - (\delta - \delta_M)w.$$

.

Since (IC) is always binding at the optimum, we can use (PK) to find that

$$u_+ + \delta_M w_+ = \frac{w}{\pi} + \lambda \frac{B}{\Delta\lambda}$$

and that

$$u_- + \delta_M w_- = \frac{w}{\pi} - (1-\lambda)\frac{B}{\Delta\lambda}.$$

Since $u_+$ and $u_-$ do not appear in the objective function, they can be eliminated and the constraints become:

$$0 \leq \pi \leq 1 \tag{1}$$

$$\pi\left(\delta_M w_- + b\right) \leq w \tag{2}$$

$$\pi\left(\delta_M w_+ - \tfrac{\lambda b}{1-\lambda}\right) \leq w.^1 \tag{3}$$

where $b \equiv \frac{B}{\Delta\lambda}$

**Determination of $V_c$:** When the bank is restructured, a new manager must be found. There are two instruments for shareholders: the continuation pay-off $w_0$ promised to the new manager (initialising the optimal contract) and, possibly, a signing bonus (or golden hand-shake) which is needed whenever $U > w_0$. In this case (scarcity of bank managers) $w_0$ is chosen so as to maximize $S(w_0) - [U - w_0]\ V_c$ equals this maximum minus restructuring cost $\Gamma$.

If on the contrary $U < w_0$, the participation constraint of the manager does not bind and shareholders choose $w_0$ to maximize $F(w_0)$ (remember that the manager has no initial wealth). Then

$$V_c = \left[\max_{w_0} S(w_0)\right] - \Gamma.$$

A direct adaptation of BMPR (2004) gives:

## Proposition (1)

*When the probability $\lambda$ of systemic crises is small enough, the optimal contract has the following characteristics:*

1. *When $w$ is small $\left(w < b \equiv (1-\lambda)\frac{B}{\Delta\lambda}\right)$, the manager is replaced (and the bank restructured) with probability $\left(1 - \frac{w}{b}\right)$. With the complement probability $\frac{w}{b}$ the manager is maintained: he receives bonus $u_+ = b\left(\frac{1}{1-\lambda} - \delta_M\right)$ if no crisis occurs, but is fired with no compensation if a crisis occurs. Continuation utilities are $w_+ = b$ in case of success, and $w_- = 0$ in case of crisis.*

## Proposition

*(continued)*

2. *When $w$ is intermediate $(b \leq w < w^* = b(1+\delta_M))$, the manager is kept with probability one. He receives a bonus $u_+ = w - b\left(\frac{1}{1-\lambda} - \delta_M\right)$ in case of success, and $u_- = 0$ in case of crisis. Continuation utility is $w_+ = b$ in case of success and $w_- = \frac{w-b}{delta_M} < b$ in case of crisis.*
3. *When $w$ is large $(w \geq w^* = b(1+\delta_M))$, the manager is kept with probability one, and is guaranteed a continuation utility $w_+ = w_- = b$ irrespective of his current performance. He receives the same current payments as in the intermediate case, to which is added an exceptional payment of $w - w^*$.*

# 5. The Case Where Bank Managers Are Scarce

In the case where bank managers are scarce, (i.e. when $U$ is relatively large) they must be promised a "golden hand-shake" $U - w_0 > 0$ in order to be attracted into the job.

$w_0$ is chosen so as to maximize $F(w_0) - (U - w_0) = V(w_0) - U$.

Thus, when the bank is created, as well as after any restructuring, the new manager is offered the continuation utility $w_0 = w^*$ that maximizes social surplus $V(w)$.

The continuation utility of the manager $w_t$, along the optimal path, always belongs to a finite subset $\{0, b, w^*\}$. In fact the optimal contract is deterministic and can be described in much simpler terms than in Proposition 1.

## Proposition (2)

*When $U > w^*$, the optimal contract can be described as follows:*

- *for the first period (grace period) the manager is kept with probability one, and guaranteed a continuation utility $w_+ = w_- = b$ irrespective of its current performance. He receives a high bonus $u_+^H = \frac{b}{1-\lambda}$ in case of success and nothing in case of a crisis;*
- *for all other periods, the manager is fired with probability one (with no indemnity) in case of crisis. In case of success, he receives a moderate bonus $u_+^M = b\left(\frac{1}{1-\lambda} - \delta_M\right)$ and is kept with probability 1.*

# Alternative Bail-out Procedures

1. Ex post surplus maximization
2. Cost minimization
3. Optimal contract

Ex post total surplus is maximized by a complete shareholders bail-out, as this avoids paying the cost $\Gamma$ for the bank restructuring.

As expected, in the non-commitment case, ex post surplus maximization will lead managers to take high risks as shareholders anticipate their bail-out.

# Cost minimization

In the event of a crisis, shareholders rights are nil
Comparing expected shareholders profits:
$S_0(\zeta = 0) = \frac{(1-\lambda')\mu}{1-(1-\lambda')\delta} - U + \frac{B}{1-(1-\lambda')\delta_M}$,
$S_0(\zeta = 1) = \frac{(1-\lambda)(\mu-(\frac{b}{1-\lambda}-\delta_M b))}{1-(1-\lambda)\delta} - (U - (1-\lambda)\frac{B}{\Delta\lambda})$
implies :
Market discipline leads to an inefficient level of risk for some parameter values . For high values of $B$ the second and third terms become larger so that $\Delta S$ will become negative and shareholders prefer to have their managers to take large risks. A lower $\mu$ will also lead to a negative value for $\Delta S$ and shareholders preference for high risk.

## Proposition (3)

*The optimal contract can be implemented as follows:*

- *During the restructuring period, the insurer charges a low systemic tax $T_0 = \lambda C$ and sets the compensation of the manager.*
- *For all subsequent periods, the insurer charges a systemic tax $T$ and let shareholders set managerial compensation.*

## Proposition (4)

*If the insurer does not control the compensation of the manager during the restructuring period, the new shareholders find it optimal to give a bonus to the manager, irrespective of its performance. As a result the manager shirks during the first period and the probability of a crisis is excessively high.*

**Proof of Proposition 4:** The optimal contract stipulates that $w_+ = w_- = b$ in the first period. The continuation value for shareholders is thus $S(b)$, irrespective of the performance of the manager. Then it is optimal for shareholders to offer to the manager a non performance based payment $U - B$ in the first period, which induces him to shirk. ■

# Policy Implications

Like in classical insurance contracts, a deductible would be needed to prevent moral hazard in capital insurance for banks. However banks' shareholders are not really in a position to monitor managers. They can only control them indirectly through their compensation packages.

Two alternatives may be considered: direct control of managers'remuneration by insurers (at least during restructuring episodes) or capital requirements forcing shareholders to incur substantial losses in case of extreme events.

Private vs public insurance provision: private insurers might default while public insurers might yield to political pressure and recapitalize banks without punishing managers and shareholders.

# Conclusion

We have explored the capital insurance proposal as a new regulatory instrument for dealing with systemic banks.

Our main result shows that such capital insurance is indeed necessary but it is not sufficient. It can only work if complemented by other regulatory tools such as capital requirements or restrictions on managerial compensation during restructuring episodes.