Bankers' Pay Structure And Risk

John Thanassoulis, University of Oxford

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Introduction

- A narrative of the recent financial crisis is that intense competition for bankers/traders resulted in pay being focused too much on short term results; and this led to huge increases in risk within the financial system.
- But why would banks, in good faith, enter into such remuneration contracts?
  - ◇ Too glib to say CEOs didn't care – and poorly supported by evidence.
- Failure to understand this runs the risk that global new rules on pay (forced bonus deferrals of 40% to 60%) will become constricting and outlive their usefulness.

I offer a clean and tractable model which:

Studies the contracting problem between banks and bankers;

Embedded in a competitive labour market for bankers.

The Model

The model has three parts:

1. A competitive model of banks/investment firms competing to hire bankers/investors.
2. Bankers/investors make investments and suffer from both moral hazard and temptation to enhance pay through myopic risk taking.
3. Combined into a dynamic game (1) hiring then (2) investing and risk taking.

The Competitive Market For Bankers

Consider market for any service offered by banks/shadow banks (eg forex, loans):

- N banks labelled by $n \in \{1, 2, .., N\}$
  - ◇ Bank n has assets devoted to this activity S_n ordered so that $S_1 > \cdots > S_N$.
  - ◇ Banks risk neutral. Banks maximize the profits generated from their fund.
  - ◇ Banks seek an individual banker to run their fund in this activity.
- N bankers the banks are competing to hire.
  - ◇ Bankers differ in their ability. May be high ability with probability $\mu_i \in (0, 1)$. Ordered so that $\mu_1 > \cdots > \mu_N$. Ability is publicly known.
  - ◇ Banker learns their realised ability after contracting, but before making their investment and effort choices. Bankers are risk neutral.

Bankers' Possible Investments

Bankers discover their ability and then invest at start $t = 1$. Returns generated at end of $t = 1$ and again at $t = 2$.

	Profit at $t = 1$	Profit at $t = 2$
High ability executive	$\begin{cases} \rho S & \text{with prob } \chi + \alpha \\ 0 & \text{with prob } 1 - (\chi + \alpha) \end{cases}$	$\begin{cases} \rho S & \text{with prob } \chi + \alpha \\ 0 & \text{with prob } 1 - (\chi + \alpha) \end{cases}$
Lesser ability executive – no myopic risk taking	$\begin{cases} \rho S & \text{with prob } \chi \\ 0 & \text{with prob } 1 - \chi \end{cases}$	$\begin{cases} \rho S & \text{with prob } \chi \\ 0 & \text{with prob } 1 - \chi \end{cases}$
Lesser ability executive – takes myopic risk	$\begin{cases} \rho S & \text{with prob } \chi + \alpha \\ 0 & \text{with prob } 1 - (\chi + \alpha) \end{cases}$	$\begin{cases} \rho S & \text{with prob } \eta \\ 0 & \text{with prob } 1 - \eta \end{cases}$
Banker, either ability, exerts 0 effort	0	0

Banker Remuneration

Fixed Wage at $t = 1 : f$. No conditioning on future performance. Paid end $t = 1$.

Non Deferred Bonus At $t = 1$**:** b. No delay. Amount b paid if success at $t = 1$.

Deferred Pay Subject to Performance: v. Bonus paid out if success at $t = 2$.

- Banks' discount rate normalised to 0.
- Bankers discount future at rate r as preference for earlier consumption. (standard in financial contracting: DeMarzo and Sannikov 2006, DeMarzo and Fishman 2007, Biais et al. 2010)
- Bankers subject to limited liability: $\{f, b, v\} \geq 0$.
- FSB guideline features captured.

- Bankers' utility has income effect.

  Use multiplicative approach of Edmans, Gabaix and Landier 2008:

  - ◇ If paid total W, and exert effort then utility is W. If exert no effort then utility rises to $W/(1-\Lambda)$. Λ captures cost of effort.

- As remuneration rises, benefits of shirking grow in proportion. Hence private benefits of shirking (leisure time) are a normal good. Standard in general equilibrium models and macroeconomics as prevents labour supply rising unboundedly with pay. Edmans et al. show necessary to rationalise relationship between CEO incentives and firm size.

- **Assume** $\eta < \chi - \alpha$ So myopic risk taking is npv negative.

Hiring And Investment Game

1. Banks bid against each other for the bankers in a competitive auction at $t = 0$.

   - Bid remuneration package (f, b, v) which is banker specific.
   - A better banker (higher μ_i) can be offered a more generous package.
   - Matching and market remuneration decided as the outcome of a standard simultaneous ascending auction for the bankers.
   - As each banker is a substitute for another, such auctions deliver the competitive equilibrium assignment (Milgrom 2000).

2. Once employed each banker learns type and decides on their actions.

   - Banker decides on investment behaviour at start of $t = 1$.
   - Profits realised and payments made at end of $t = 1$ and $t = 2$.

Method Of Solution

- Competition between the banks for bankers will determine the utility a bank of rank m would need to offer a banker of rank n.
- How a bank delivers utility (u) to a banker is the bank's choice.
- Seek optimal contracts delivering u which prevent/allow, myopic risk taking:

Lemma: Deferred Bonus And Myopic Risk Taking

Suppose contract $\{f, b, v\}$ induces effort. A banker of lesser ability will not myopically take risks if and only if:

$$(\chi - \eta) \cdot v / (1 + r) \geq \alpha \cdot b$$

- Any bonus b encourages myopic risk taking. This is only prevented if deferred pay (v) is sufficiently large.

Proposition: Best Contract Delivering No Myopic Risk Taking

To hire banker with outside option $u \geq 0$ ensuring no myopic risk taking:

1. Deferred pay reduced till no myopic risk taking condition becomes binding.

2. The optimal contract is:

$$
\begin{aligned}
f &= \frac{\chi(1-\Lambda)}{\chi+\alpha\Lambda\mu}u \\
b &= \frac{\Lambda(\chi-\eta)}{(\chi+\alpha-\eta)(\chi+\alpha\Lambda\mu)}u \\
v &= \frac{\alpha\Lambda(1+r)}{(\chi+\alpha-\eta)(\chi+\alpha\Lambda\mu)}u
\end{aligned}
$$

3. The bank enjoys a payoff of

$$
\left(2\rho S - \frac{r\alpha\Lambda}{(\chi+\alpha-\eta)(\chi+\alpha\Lambda\mu)}u\right)(\chi+\alpha\mu) - u
$$

- The bank optimises subject to: no myopic risk taking condition; participation constraint that utility u is delivered; banker exerts effort, whether or not higher or lesser ability realised.

- To manage moral hazard problem some variable bonus $\{b, v\}$ required.

- However any immediate bonus (b) creates incentive to take myopic risk.
  Managed by deferred bonus.

- But deferred bonus is expensive as banker discounts more than bank.

- Hence optimal contract minimises bonus subject to no myopic risk taking.

- The level of the bonuses depends on the outside option. There is a unique optimal contract even though we have risk neutrality.

Proposition: Best Contract Permitting Myopic Risk Taking

If the bank wishes to hire a banker with outside option $u \geq 0$ and permit a banker who realises they are of lesser ability taking myopic risks then:

1. Deferred (vested) pay falls to $v = 0$.

2. A range of contracts are optimal:

$$f + (\chi + \alpha)\, b = u \text{ and } (\chi + \alpha)\, b \geq f \frac{\Lambda}{1 - \Lambda}$$

3. The payoff of the bank for **any** of these contracts is:

$$[(1 + \mu)(\chi + \alpha) + \eta (1 - \mu)]\, \rho S - u$$

- Deferred pay expensive as banker discounts it. Needed to stop myopic risk taking.

- If myopic risk taking is tolerated then bank uses only immediate bonus: b.

  Multiplicity of contracts as banker risk neutrality – but bank payoff unique.

High Banker Outside Options And Bank Tolerance Of Myopic Risk Taking

Proposition: *If banker's outside option* (u) *is sufficiently high then banks will offer contracts which permit myopic risk taking.*

Permitting Myopic Risk Taking is optimal if

$$\frac{r\alpha\Lambda\left(\chi+\alpha\mu\right)}{\left(\chi+\alpha-\eta\right)\left(\chi+\alpha\Lambda\mu\right)}\cdot u>\left(1-\mu\right)\left(\chi-\alpha-\eta\right)\rho S$$

The logic of outside options and myopic risk taking

- Consider a bank employing its banker with a contract which delivers no myopic risk taking. Deferred pay is just sufficient to discourage myopia.

Suppose banker's outside option rises:

- Some of this extra utility can be provided by the fixed wage. But to maintain incentives for effort variable remuneration must rise. *(Income effect in utility).*
- To prevent myopic risk taking deferred pay must rise.
- But deferred pay is discounted – it must rise faster than outside option – otherwise myopia is introduced.
- Allowing myopia hiring is cheaper, but potential for loss greater. Eventually preferable.

Competition For Bankers and Excessive Risk

- Now we solve the full model, endogenising outside options.
- First the equilibrium in which all banks compete in non myopia inducing contracts.

Proposition: Market Equilibrium

In the equilibrium in which no bank prefers to offer myopia inducing contracts to the bankers, there will be positive assortative matching. The banker of rank n, will be employed at bank n with fund S_n. The banker of rank n will receive utility u^n. Calibrating the worst baker as $u^N = 0$:

$$u^n = \sum_{j=n+1}^{N} 2\alpha\rho S_j \left[\mu_{j-1} - \mu_j\right] \cdot \left[1 + \frac{r\alpha\Lambda\left(\chi + \alpha\mu_n\right)}{\left(\chi + \alpha - \eta\right)\left(\chi + \alpha\Lambda\mu_n\right)}\right]^{-1}$$

- With no impatience or myopia then **positive assortative matching** would follow from standard arguments: efficiency maximised by matching better banker to larger bank.

- Complication: transfers from the bank to the bankers throuh contracts which do not permit myopia: deferred pay. Discounting implies utility not transferable.

- Proof demonstrates larger banks would bid more anyway.

Then the Inductive Step

- Bank of rank $n+1$ will hire the banker of the same rank. However it will be the marginal bidder for the banker one spot up in the league table of quality: banker n.

- Thus utility which has to be offered to the banker of rank n depends upon the fund size of those banks which rank at or below S_{n+1} in the size league table.

Proposition: A **Sufficient** Condition For Myopia in Equilibrium is if

$$\sum_{j=n+1}^{N} 2\alpha \frac{S_j}{S_n}\left[\frac{\mu_{j-1}-\mu_j}{1-\mu_n}\right] > \left(\frac{(\chi+\alpha-\eta)(\chi+\alpha\Lambda\mu_n)}{r\alpha\Lambda(\chi+\alpha\mu_n)}+1\right)(\chi-\alpha-\eta) \text{ for some } n$$

A Negative Externality:

- Larger banks bid more and so push remuneration for all up.
- In bidding banks not considering the risks which they impose on their rivals (externality).
- To deliver ever higher levels of utility the employing bank will ultimately find it preferable to use contracts which permit myopic risk taking.

Corollary: When Is Myopic Risk Taking More Likely To Enter Financial System:

1. If bankers are more impatient.

2. If ability makes a greater contribution to profit generation: α increases.

3. If probability myopic risk taking will mean failure, $(1-\eta)$, declines.

And also if there is convergence amongst the largest banks:

Suppose that each of the top m banks grows in size by $\{\sigma_n\}$, preserving size ranking, such that $\sigma_n > \sigma_{n-1}$ (convergence). If m is large enough then myopic risk taking sufficient condition more likely to be triggered for top $m-1$ firms.

- Result requires that $\mu_{j-1} - \mu_j > \mu_j - \mu_{j+1}$ for all j. Standard assumption on skills distribution.

Convergence And The Myopia Inducing Equilibrium

- Positive assortative matching can be guaranteed if (recall $\alpha < \chi - \eta$) for all n

$$\alpha \left(1 + 2\frac{\mu_{n-1} - \mu_n}{1 - \mu_{n-1}} \right) > \chi - \eta$$

  - ◇ Ability important enough a larger bank would always wish to secure it.

Proposition: Suppose there is a rank m such that for any bank of higher rank, $n \leq m$, convergence is sufficient that

$$(1 - \mu_{n-1}) S_{n-1} < (1 - \mu_n) S_n$$

Then if bank n uses a myopia inducing contract, then so does bank $n - 1$.

- If non-myopic equilibrium should break down, then all the largest banks will move to contracts permitting myopic risk taking by less able bankers.

Empirical Discussion

- Convergent balance sheets lead to increased competition for bankers and higher outside options. *Makes myopia inducing contracts more likely.*

Is this a more or a less compelling concern over the last 40 years?

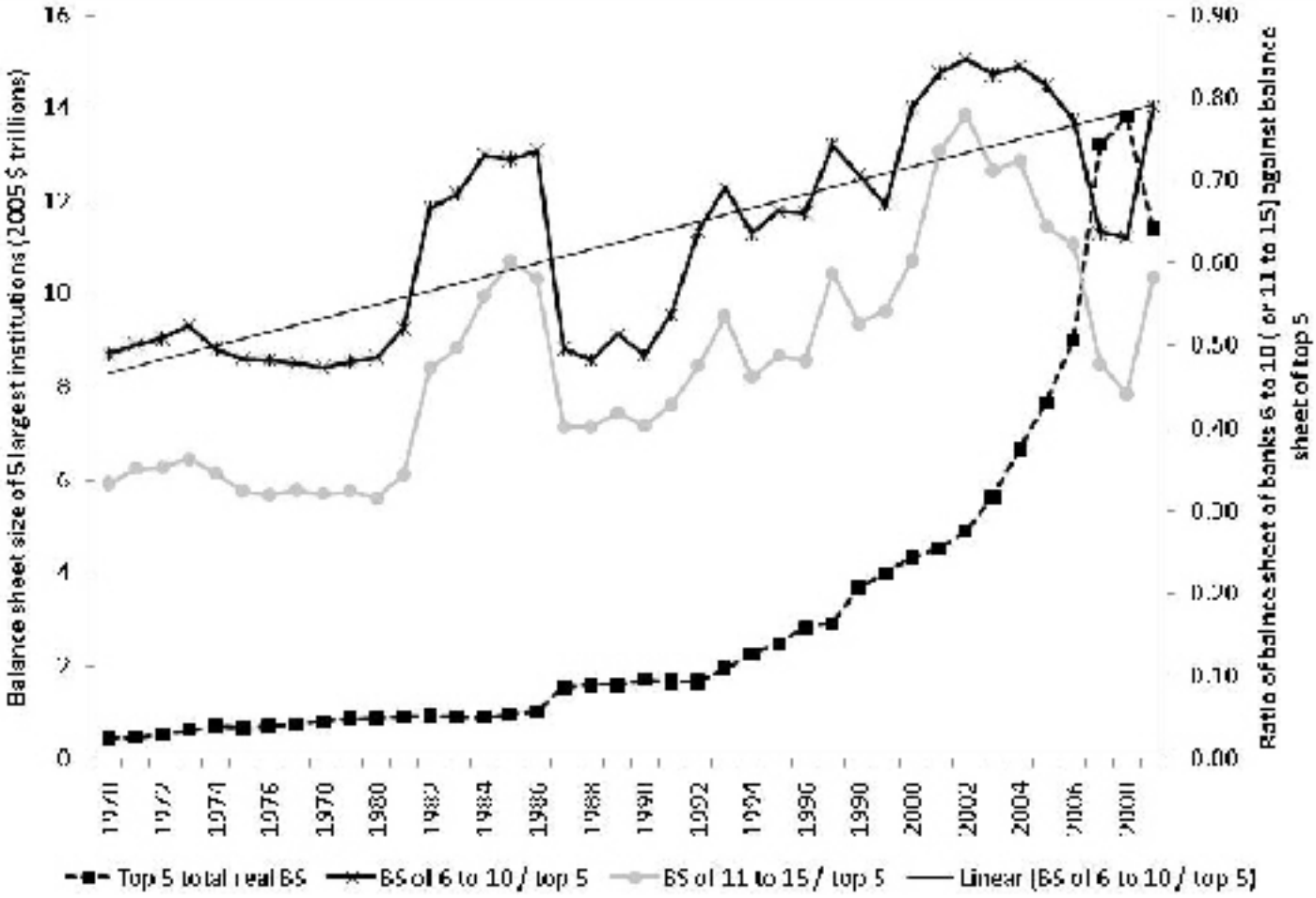
- Balance sheet data (Compustat): all firms with SIC 6000 to 6300 for 1970 to 2009. (constant 2005$)

- Widely reported that leverage grew substantially in the run up to the financial crisis. Total balance sheet (real $) of the 5 largest grew from $450bn in 1970 to $14tr in 2008.

- **But** banks ranked 6 to 10 have grown their balance sheets even faster.

  Same true of banks ranked 11 to 15.

  Banks 6 to 10 grew from half of top 5 in 1970 to nearly 90% of the top 5 in 40 years.


Balance sheet size of 5 largest institutions (2005 $ trillions)
Ratio of balance sheet of banks 6 to 10 (or 11 to 15) against balance sheet of top 5
16
14
12
10
8
6
4
2
0
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1976
1980
1984
1988
1992
1996
2000
2004
Top 5 total real BS
BS of 6 to 10 / top 5
BS of 11 to 15 / top 5
Linear (BS of 6 to 10 / top 5)

Conclusion Competitive negative externality:

- Banks use bonus pay to manage moral hazard.
- But such incentives encourage myopic risk taking to earn bonus.
- So some pay must be deferred. But deferred pay of reduced value (discounting).
- If required banker surplus rises then costs of contracts preventing myopic risk taking go up faster than contracts permitting myopia:

  Eventually balance of cost and benefits swings.
- Convergent balance sheets drive up pay and so increase risk of moving to myopia.
- If sufficient convergence then largest firms will bring in myopia permitting contracts.
- Bank balance sheets have seen convergence over last 40 years...