Separating Proprietary Trading from Deposit Banking: Consequences for Financial Stability

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1. Introduction

- Financial crisis: banks' trading implicitly subsidized by deposit insurance
- Regulatory trend towards separate banking ("ringfencing")
  - *Volcker* Rule: §619 of Dodd-Frank Act (draft July 2010, in effect since July 2012)
  - *Vickers* Report (draft September 2011, in effect since December 2013)
  - *Liikanen* Report (draft October 2012 $\rightsquigarrow$ proposal on Banking Structural Reform on 29.01.2014)

A stylised comparison of selected structural reform proposals

Table V.A

	Volcker: institutional separation	Liikanen: subsidiarisation	Vickers: ring-fencing
Permissible activity and structure	Remove certain investment activities from bank holding companies	Proprietary and higher-risk trading activity have to be placed in a separate legal entity	Structural separation of activities via a ring fence for retail banks
Deposit-taking institution			
• deal as principal in securities and derivatives	No	No	No
• invest in hedge funds and private equity	No	No	No
• engage in market-making	Yes	No	No
• provide underwriting	Yes[1]	Yes	Restricted
• hold non-trading exposures to other financial intermediaries	Unrestricted	Unrestricted	Restricted (inside the group)
Holding company with banking and trading subsidiaries	Not permitted	Permitted	Permitted
Geographic scope	Unrestricted	Unrestricted	Limitations on the ability of UK ring-fenced banks to provide services outside the European Economic Area[2]

[1] Underwriting in response to demand from clients and counterparties. [2] The European Economic Area is the European Union plus Iceland, Liechtenstein and Norway.

Literature — Recent Discussion

- *Boot Ratnovski* (IMF 2012) "Proprietary Trading and the Real Economy" (theory)
  - (prop) trading is profitable addition in banks' portfolios
  - banks trade too much, relationships break down
- *Arping* (WP 2013) "Proprietary Trading and the Real Economy" (theory)
  - safety net induces banks to gamble (prop trading)
  - gambling is socially wasteful, drives out loans
- Empirical: *Brunnermeier Dong Padlia* (WP 2012)
- Conceptional: *Chow Surti* (IMF 2011), *Thakor* (WP 2012), *Duffie* (World Econ. Forum, 2012)

Our Paper

- Need to discuss consequences of deposit insurance $\rightarrow$ endogenize *deposit insurance*
- Classical approach: *Diamond Dybvig* (JPE 1983), but any model where deposit insurance prohibits panic runs would also do (Diamond Rajan JPE 2001, Gorton Pennacchi JoF 1990)
- Tidy up DD83 (*simpler preference* structure) to make room for new model ingredients
- To be able to discuss proprietary trading, differentiate between *fungible* vs. *non-fungible* assets (*securities* vs. *loans*)
- Finally, *cash-in-the-market* pricing (endogenized by investors that appear at the intermediate date)

Our Paper – Results

- First, we rediscover all results from DD83 — reassuring, simplifications are not excessive
- Especially, the panic equilibrium exists
- Introduction of *deposit insurance* makes the panic equilibrium disappear, but induces banks to more risk
  - Fungible securities are traded → information about future performance
  - In effect, at the intermediate date, loans are not (yet) risky
  - Banks that only invest in loans use dep. ins. with prob. zero
  - Investing in securities becomes relatively more attractive
- Political argument: dep. ins. induces *moral hazard*
- Introduction of *separate banking* deletes moral hazard, *but*
  - No liquidity insurance for some consumers
  - Consequences for investors (–) and loan volume (–)

Separating Proprietary Trading from Deposit Banking

Consequences on Financial Stability

Consumers

- Mass 1 of consumers, endowed with 1$ each
- Born in $t = 0$, live until date 1 or 2
- Preferences similar to *Diamond Dybvig (1983)*
- Probability α: "early" consumer, consumer receives extra utility from consumption up to some threshold c_0 (target)

$$u(c_1, c_2) = \begin{cases} \mu\, c & \text{for } c < c_0 \\ \mu\, c_0 + (c - c_0), & \text{for } c \geq c_0 \end{cases}$$

  with $\mu > 1$
- Probability $1 - \alpha$: late consumer, utility $u(c_1, c_2) = c_1 + c_2$

Assets (Securities and Loans)

	$t=0$	$t=1$	$t=2$
storage	-1	1	
		-1	1
loan (non-fungible)	-1		R (prob. ρ)
			0 (prob. $1-\rho$)
security (fungible)	-1	p	S (prob. σ)
		0	0 (prob. $1-\sigma$)

- Assume: loans and securities *uncorrelated* (dropped later)
- Assume: $\rho R > \sigma S > 1$
  - Endogenously, securities are in the *trading book*
  - Banks prime business is loans, but securities can be an interesting investment in the short run (*speculation*)
- Loans can neither be liquidated nor sold
- Securities can be sold; price determined by *investors'* demand $\rightarrow$ investors thus supply liquidity at $t=1$

Investors

(Cash-in-the-Market Pricing)

- Mass 1 of investors born in $t = 1$, live until $t = 2$, endowed with wealth w (in cash)
- Utility function (with $y_0, y_1 > 0$ constants)

$$c_1 + \log(y_0 + y_1\, c_2)/y_1$$

- Let p be the date-1-price of one *security* at date 2
- Investors maximize

$$\max_{c_1, c_2} \quad c_1 + \log(y_0 + y_1\, c_2)/y_1$$
$$\text{s.t.} \quad c_2 = (w - c_1) \cdot S/p \qquad (1)$$

which implies $c_2 = \frac{1 - p\, y_0}{y_1\, p/S}$, thus $p = \frac{S}{y_0 + y_1\, c_2}$

- The price p decreases if investors are forced to buy more
- Increased supply in “investment products” reduces the price

Time Line

$t = 0$ Financial intermediaries (banks) may form; banks choose their investment strategy (storage, loans, securities) and refinancing strategy; if they refinance with deposits, they announce short and long deposit rates r_1 and r_2

* Consumers invest directly, or deposit at banks; banks invest

$t = 1$ Security shock: the *security's* future performance (S or 0) is *observed*

* Liquidity shocks: consumers observe their preference
* Security market: banks sell or buy securities (between themselves and from investors), the security price depends on the realization of the future performance
* Consumers can withdraw deposits from banks

$t = 2$ Loans pay out R with prob. ρ; securities pay out S or 0

* Banks pay out late consumers

Laissez-Faire I — The Classical Bank

- Due to Diamond-Dybvig-style preferences, financial intermediaries (banks) form endogenously
- *Deposit contracts*, promising $r_1 = c_0$ in $t = 1$, residual later
- Classical bank (*“safe bank”*)
  - store $\alpha\, r_1 = \alpha\, c_0$
  - invest the remaining $1 - \alpha\, c_0$ into loans
  - late return:

    $$r_2^{\text{safe}} = \frac{1 - \alpha\, c_0}{1 - \alpha}\, R$$

    is paid with prob. ρ, otherwise 0
  - concentrate on the *good equilibrium*: expected utility is

$$EU^{\text{safe}} = \alpha\, \mu\, c_0 + (1 - \alpha)\, \rho\, \frac{1 - \alpha\, c_0}{1 - \alpha}\, R$$

- Expected utility without deposits: $EU = \alpha\, \mu + (1 - \alpha)\, \rho\, R$
- Assumption: deposit contract raises utility, $\mu > \rho\, R$

Laissez-Faire II — Risky Banks

- Question: do banks invest in securities?
  - will not substitute loans by securities: lower late return
  - will not substitute storage by securities: risk of failure → run
  - but then, if no banks buy securities, there is no supply in $t = 1$, and p will be high → securities ideal instrument for storage
- Answer: yes, some (*“risky banks”*)
  - these banks do not store, they hold securities and loans
  - trade-off: need to invest less in securities than in storage → can buy more loans
  - if securities perform bad (probability $1 - \sigma$) → run → liquidation of all loans, zero worth of securities
  - Expected utility of depositors

$$EU^{\text{risky}} = (1 - \sigma) \cdot 0 + \sigma \left(\alpha \, \mu \, c_0 + (1 - \alpha) \, \rho \, r_2^{\text{risky}} \right)$$

Laissez-Faire III — Risky Banks

- Budget constraint for risky banks:

$$r_2^{\text{risky}} = \frac{1 - \frac{\alpha c_0}{p}}{1-\alpha} R,$$

which is paid with probability ρ (loans must repay) times σ (speculation in securities must repay)

- Consumers must be indifferent, $EU^{\text{safe}} \stackrel{!}{=} EU^{\text{risky}}$, thus

$$p^* = \sigma \left(\frac{\rho R - (1-\sigma)\mu}{\rho R} - \frac{1-\sigma}{\alpha c_0} \right)^{-1}$$

- If $\sigma \to 1$ (securities bear no risk), then $p^* \to 1$

Laissez-Faire IV — Market Clearing

- Market clearing: in the bad state, securities are worth nothing, hence there is no market to be cleared
- Good state: each risky bank holds $s = \frac{\alpha\, c_0}{p\, S}$ securities
- Assume there are λ risky banks
- Aggregate volume of securities at date 2: $\lambda\, s\, S = \lambda\, \alpha\, c_0\, S/p^*$
- Market clearing: $p^* = \frac{1}{y_0 + y_1\, (\lambda\, \alpha\, c_0/p^*)}$, thus

$$\lambda = \frac{1 - p^*\, y_0}{y_1\, \alpha\, c_0}$$

with p^* as calculated above

Laissez-Faire VII — Numerical Example

- $\alpha = 1/3$; $c_0 = 1.2$; $\mu = 3$;
  $\rho = 1$; $R = 2.0$; $\sigma = 0.9$; $y_0 = 1$; $y_1 = 1/2$
- $r_1^{\text{safe}} = r_1^{\text{risky}} = c_0 = 1.2 \cong 20\%$
- $r_2^{\text{safe}} = \frac{1-\alpha\, c_0}{1-\alpha}\, R = 1.8 \cong 80\%$, that is, 50% between $t = 1$ and $t = 2$
- $r_2^{\text{risky}} = \frac{1}{\sigma}\left(\frac{1-\alpha\, c_0}{1-\alpha}\, R + (1-\sigma)\,\mu\,\frac{\alpha}{1-\alpha}\, c_0\right) = 1.989$
- $p^* = 1.1875$
- This yields an additional constraint: for $p > S$, the security is dominated by storage (from the viewpoint of investors), banks then follow only the *safe* strategy
- Volume of risky banks $\lambda = \frac{1-p^*\, y_0}{y_1\,\alpha\, c_0} = 27.34\%$

Laissez-Faire VII — Two More Constraints

- As in Diamond Dybvig, we must have $r_2^{\text{safe}} \geq r_1$, otherwise even late depositors prefer to withdraw early:

$$c_0 \leq \rho \, \frac{R}{\rho \, \alpha \, R + (1 - \alpha)}$$

- For $p < S$, the condition is even stricter,

$$r_2^{\text{safe}} \geq r_1 \, S/p,$$
$$c_0 \leq \rho \, \frac{R}{\rho \, \alpha \, R + (1 - \alpha) \, S}$$

Laissez-Faire IX — "Welfare"

- *Two* components of welfare (consumers and investors)
  - different "life spans", different utility functions
  - meaningless to aggregate utilities
  - treat utilities of subgroups *separately*
- *Consumer* welfare does not differ between safe and risky banks (indifference condition)

$$EU_{\text{Cons}} = (1 - \alpha\, c_0)\, \rho\, R + \alpha\, c_0\, \mu$$

- *Investor* welfare

$$EU_{\text{Inv}} = w + \sigma\, \frac{y_0\, p^*/S - (1 + \log p^*/S)}{y_1}$$

  *de*creases in p
- Remember: if $p^* > S$, securities are dominated → no risky banks, no securities to buy,

$$EU_{\text{Inv}} = w + \sigma\, \frac{y_0 - 1}{y_1}$$

Laissez-Faire X — Loan Volume

- Loan volume can influence welfare due to externalities (firm profits, unemployment, . . .)
- Can be calculated in the model
- Safe banks store $\alpha\, c_0$, hence loan the volume is $1 - \alpha\, c_0$
- Risky banks have $s = \frac{\alpha\, c_0}{p^*}$, loan volume $1 - s$
- Aggregate loan volume

$$L = (1 - \lambda)\,(1 - \alpha\, c_0) + \lambda \left(1 - \frac{\alpha\, c_0}{p^*}\right)$$

with $\lambda = \dfrac{1 - p^*\, y_0}{y_1\, \alpha\, c_0}$ as before

- Absence of risky banks (because securities are dominated)

$$L = 1 - \alpha\, c_0$$

- Risky banking raises loan volume, *no crowding out*

Separating Proprietary Trading from Deposit Banking

Consequences on Financial Stability

Deposit Insurance I — Setting

- Assumption: state has money, designated for buying a public good (different part of consumer's utility function)
- Money can be used for bailing out banks
  - Deposit insurance $\cong$ bail-out are synonyms here
  - Liquidity provision by central bank: critical question how CB discounts securities (especially if their price has fallen)
- Safe bank: does not fail in good equilibrium; expected utility EU^{safe} unchanged
- Risky bank: pays $r_1 = c_0$ and r_2^{risky} with probability $1 - \varepsilon$ (good state); in the bad state, nothing can be paid $\rightarrow$ deposit insurance helps out, pays r_1 to all
- Expected utility

$$EU^{\text{risky}} = \alpha\, c_0\, \mu + (1-\alpha)\left(\sigma\, \rho\, r_2^{\text{risky}} + (1-\sigma)\, c_0\right)$$

Deposit Insurance II — Equilibrium

- Consumers must be indifferent, $EU^{\text{safe}} \stackrel{!}{=} EU^{\text{risky}}$, thus

$$p^* = \sigma \left(1 - (1-\sigma)\,\frac{\rho\,R - (1-\alpha)\,c_0}{\alpha\,c_0\,\rho\,R}\right)^{-1}$$

  lower than before

- Because p falls in security volume, more banks λ choose the risky strategy
- Intuition: without dep. ins., only risky banks fail (in the good equilibrium), hence only these benefit
- Here: free dep. ins., but results also hold for fairly priced dep. ins. (if it were possible): still, only risky banks benefit
- Numerical example: $p^* = 38/37 = 1.027$ and $\lambda = 57.43\%$

Deposit Insurance III — "Welfare"

- *Three* components (consumers, investors, *deposit insurance*)
  - again, impossible to aggregate utilities
  - treat utilities subgroups separately
- Consumer welfare does not differ between safe and risky banks (indifference condition), thus unchanged by deposit insurance
- Investor welfare decreasing in p, as before $\implies$ *benefit*
- Deposit insurance *only pays*

$$EU_{\text{Dep. Ins.}} = -\begin{cases} \lambda (1-\sigma)\,\alpha\, c_0 & \text{for } p^* \leq S \\ 0 & \text{for } p^* > S \end{cases}$$

- Stability *decreases* (more risky banks)
- Loan volume: *effect unclear*
  - More risky banks $\rightarrow$ higher loan volume
  - p^* closer to 1 $\rightarrow$ speculation not much better than storage (and even that only with probability σ)

Separating Proprietary Trading from Deposit Banking

Consequences on Financial Stability

Separate Banking I — Setting

- Separate Banking: *deposit banks* may not buy securities
- *Investment banks* may buy securities, but not finance with deposits
- Equivalently: "risky" consumers invest *directly* into securities
- Risky consumers also invest into loans through deposit banks, but not storage $\rightarrow r_1 \approx 0$ (specialization of deposit banks)
- The expected utility of "safe" consumers is EU^{safe}, as before

Separate Banking II — The Risky Consumer

- Risky consumer: invests s into securities
- Just enough to consume c_0 under liquidity shock, thus $s\,p = c_0$
- The expected utility of “risky” consumers (investing s in the security) is

$$EU^{\text{risky}} = \sigma\left(\alpha\,\mu\,s\,p + (1-\alpha)\,(s\,p + (1-s)\,\rho\,R\right)$$
$$+ (1-\sigma)\left(\alpha\,\mu\,s\cdot 0 + (1-\alpha)\,(s\cdot 0 + (1-s)\,\rho\,R\right)$$

- The indifference condition yields

$$p^* = \Big(\frac{c_0-1}{c_0}\,\frac{\alpha}{1-\alpha} + \frac{\sigma+\alpha\,(\sigma\,\mu-\sigma-\mu)}{(1-\alpha)\,\rho\,R}\Big)^{-1}$$

- Numerical example: $p^* = 1.92$, possibly larger than S

Separate Banking III — Welfare

- Consumer welfare: unchanged in comparison to “deposit insurance”
- Investors: pay higher prices, thus *lower welfare*
- Deposit insurance: $EU_{\text{Dep. Ins.}} = 0$
- Stability: *increased* in comparison to “deposit insurance”, even in comparison to “laissez faire”
- Loan volume: *reduced* in comparison to “deposit insurance”, also in comparison to “laissez faire”

Separate Banking III — Summary

- Separate banking erases the moral hazard induced by deposit insurance
- But speculation per se is welfare increasing
  - Consumers are indifferent
  - Investors profit from lower security prices
  - Loan volume increases because banks need to store less
- The package (deposit insurance + separate banking) involves a trade-off
  - Bad equilibrium (bank runs) avoided
  - But negative for “markets” (investors) and “growth” (loan volume)

Diversification

- Basic model: correlation of zero between loans and securities, thus no diversification
- Assumption now: loans perform with prob. ρ, securities with prob. $\bar{\sigma}$ *given that loans perform*
- If $\bar{\sigma} > \sigma$, positive *correlation*, otherwise *diversification*
- Laissez faire: correlation benefits "risky" banks (those that hold securities)
  - If securities do not perform, the bank fails
  - Loans are liquidated, hence no harm if they also would have failed
- Dep. ins.: diversification benefits dep. ins., hence harms risky banks
  - If dep. ins. pays out consumers, with large probability it retrieves some money from the loans
- Sep. banking: correlation does not matter for utility levels

Security Price Contagion

- Basic model: securities return nothing in the bad state
- *Assumption*: positive return S_0 of securities in the bad state
- Channel of security (asset) price contagion:
  - Run on one bank
  - Must sell securities
  - Security price falls
  - Other banks must liquidate more
  - Run on other banks $\rightarrow$ *contagion*

7. Conclusion

- Starting point: Diamond-Dybvig style model with illiquid loans and liquid assets (“securities”)
- Standard outcome: deposit banks form, but are prone to panic runs
- Deposit insurance helps, but leads to moral hazard (too many banks over-invest in securities)
- Interim investors profit, loan volume increases, disintermediation
- Introduction of separate banking (Volcker, Vickers, Liikanen) *increases stability*
- Effects of deposit insurance cannot be undone, loan volume ($\sim$ growth) lower than under “laissez faire”
- Alternatives: risk-sensitive deposit insurance? equity injections? capital requirements?