Could making banks hold only liquid assets induce bank runs?

Karl Shell

Cornell University

James Peck

The Ohio State University

Presentation by Ludovico Genovese and Alessandro Pistoni

Agenda

- Contextualization
- Model: assumptions (vs Diamond-Dybvig)
- Banks (unified and separated system)
- Welfare maximization problem
- Results
- Take-aways

Contextualization

- Glass-Steagall Act (Banking Act of 1933)

  "To provide for the ***safer*** *and* ***more effective*** *use of the assets of banks, to regulate interbank control, to prevent the undue diversion of funds into speculative operations* […] *."*

- Repeal of Glass-Steagall Act (1999)

Is Glass-Steagall's repeal to blame?

- Paul Volcker (March 2009)

  "Maybe we ought to have a ***two-tier financial system****."*

  "This institutions should not be taking extraordinary risks in the market place represented by hedge funds, equity funds, large-scale proprietary trading. Those things would put their basic functions in jeopardy"

- Could making banks hold only liquid assets induce bank runs? (PS, April 2010)

Model

- 3 periods: $T = 0$ $T = 1$ $T = 2$
- Continuum of consumers: $[0; 1]$
- Single good (costless storage)
- Each endowed with y in $T = 0$

Model

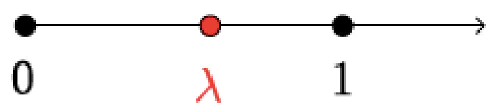
- In $T = 0$ each consumer is identical
- In $T = 1$ they discover their type (patient or impatient)
- Private information
- Sequential service constraint
- Until now, same assumptions as in Diamond and Dybvig (1983)

Model

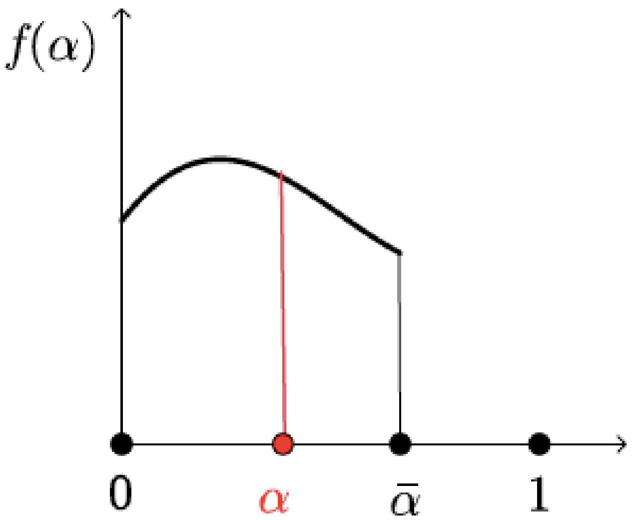
- α : probability of being impatient
- α is a random variable with density f
- Support: $[0, \bar{\alpha}]$ $\bar{\alpha} < 1$
- $\bar{\alpha}$: maximum proportion of impatient consumers

What is the difference?

Diamond-Dybvig



Peck-Shell



$\Downarrow$

Intrinsic uncertainty

The utility functions

$$U_I(C_I^1, C_I^2) = \begin{cases} \bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 \geq 1 \\ \beta\bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 < 1 \end{cases}$$

$$U_P(C_P^1, C_P^2) = \bar{u} + u(C_P^1 + C_P^2 - 1)$$

The utility functions

$$U_I(C_I^1, C_I^2) = \begin{cases} \bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 \geq 1 \\ \beta\bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 < 1 \end{cases}$$

$$U_P(C_P^1, C_P^2) = \bar{u} + u(C_P^1 + C_P^2 - 1)$$

C_I^1: consumption available to an impatient in $T = 1$

The utility functions

$$U_I(C_I^1, C_I^2) = \begin{cases} \bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 \geq 1 \\ \beta\bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 < 1 \end{cases}$$

$$U_P(C_P^1, C_P^2) = \bar{u} + u(C_P^1 + C_P^2 - 1)$$

C_P^1: consumption available to a patient in $T = 1$

The utility functions

$$U_I(C_I^1, C_I^2) = \begin{cases} \bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 \geq 1 \\ \beta\bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 < 1 \end{cases}$$

$$U_P(C_P^1, C_P^2) = \bar{u} + u(C_P^1 + C_P^2 - 1)$$

C_I^2: consumption available to an impatient in $T = 2$

The utility functions

$$U_I(C_I^1, C_I^2) = \begin{cases} \bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 \geq 1 \\ \beta\bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 < 1 \end{cases}$$

$$U_P(C_P^1, C_P^2) = \bar{u} + u(C_P^1 + C_P^2 - 1)$$

C_P^2: consumption available to a patient in $T = 2$

The utility functions

$$U_I(C_I^1, C_I^2) = \begin{cases} \bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 \geq 1 \\ \beta\bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 < 1 \end{cases}$$

$$U_P(C_P^1, C_P^2) = \bar{u} + u(C_P^1 + C_P^2 - 1)$$

$\bar{u}$: incremental utility of:

- 1 unit of consumption in $T = 1$ for an impatient
- 1 unit of consumption in $T = 2$ for a patient

The utility functions

$$U_I(C_I^1, C_I^2) = \begin{cases} \bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 \geq 1 \\ \beta\bar{u} + u(C_I^1 + C_I^2 - 1) & if \quad C_I^1 < 1 \end{cases}$$

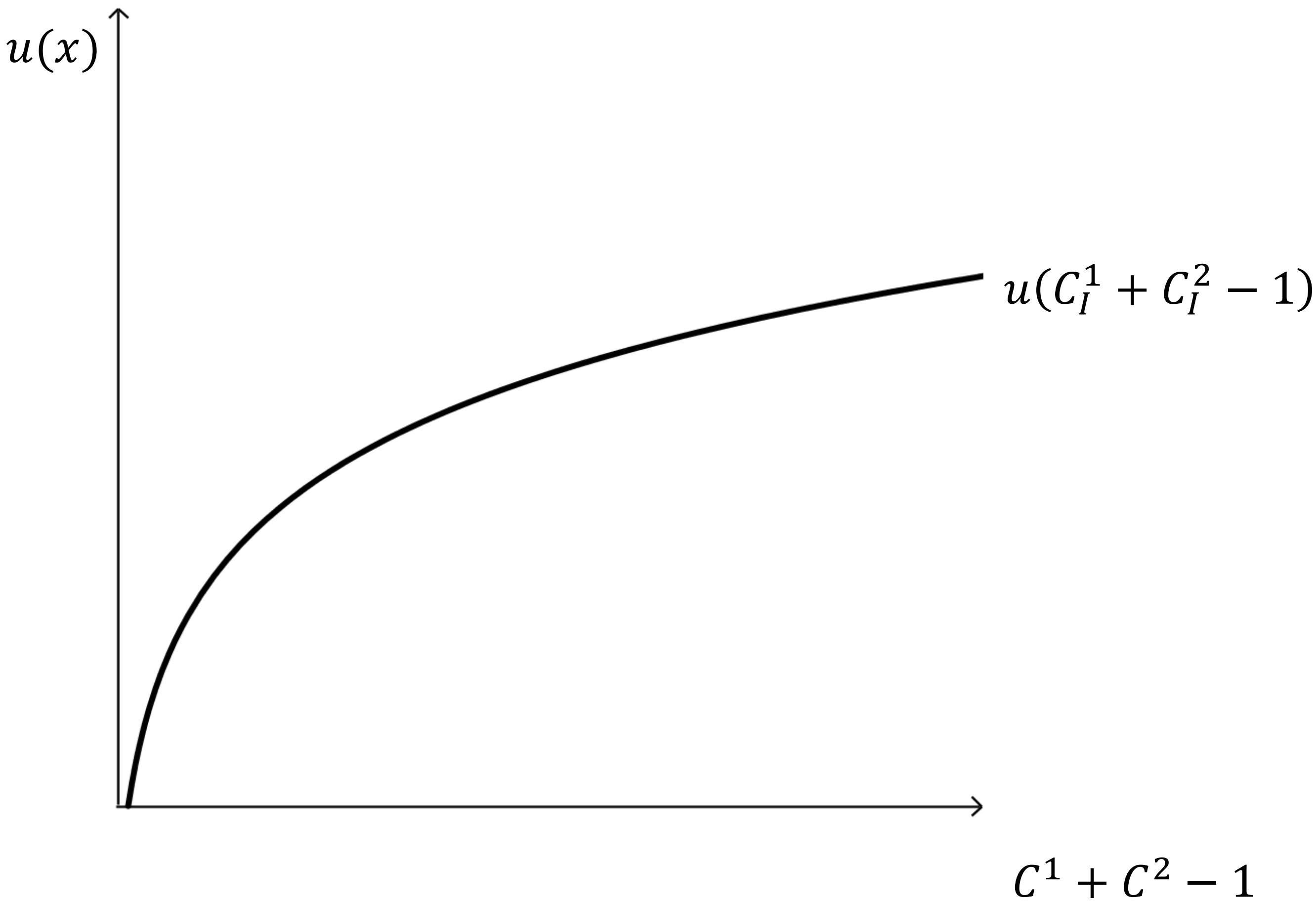
$$U_P(C_P^1, C_P^2) = \bar{u} + u(C_P^1 + C_P^2 - 1)$$

$\beta\bar{u}$: incremental utility of 1 unit of consumption in $T = 2$ for an impatient

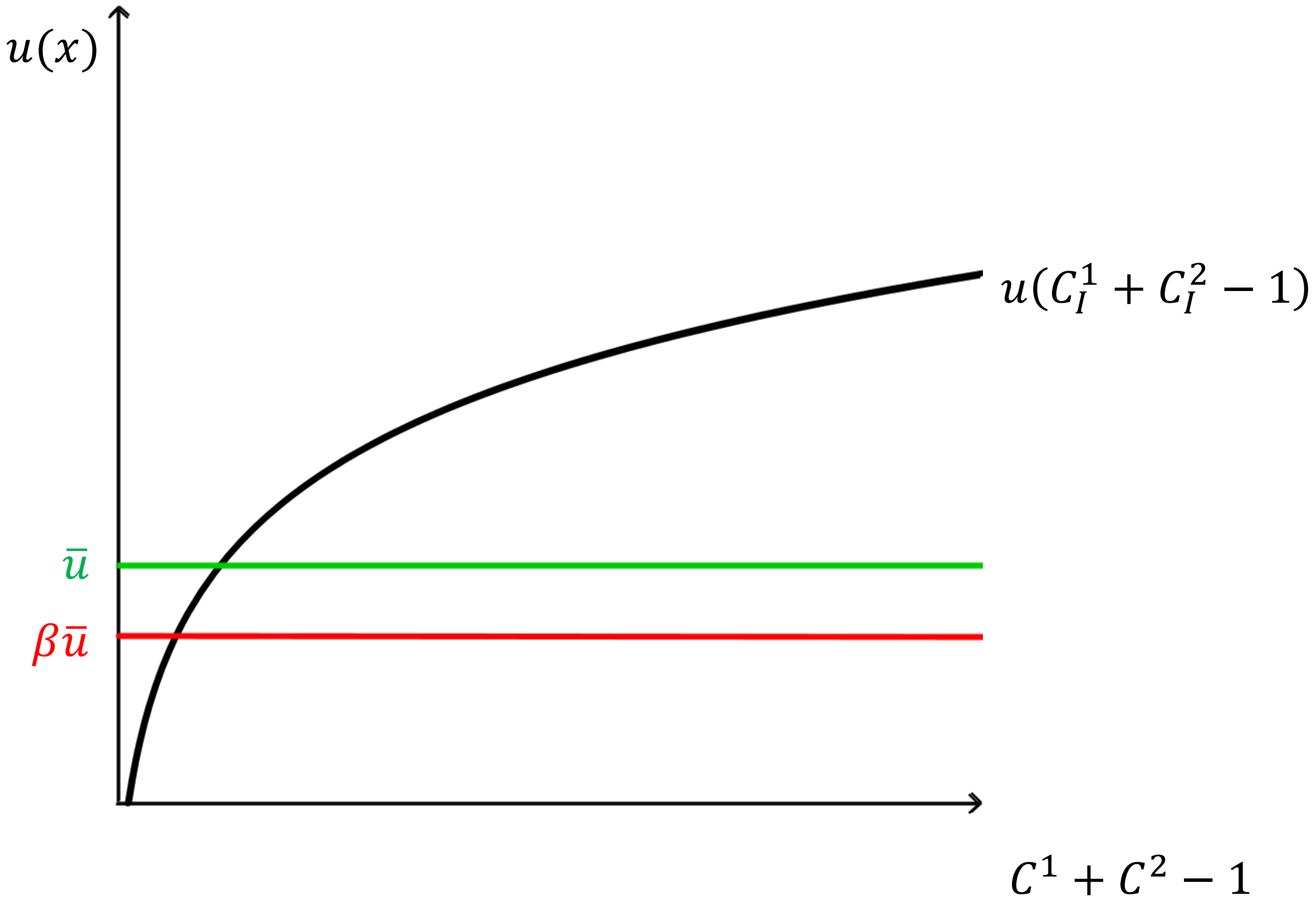
The utility functions

$u(C^1 + C^2 - 1)$: utility from “*left–over*” consumption

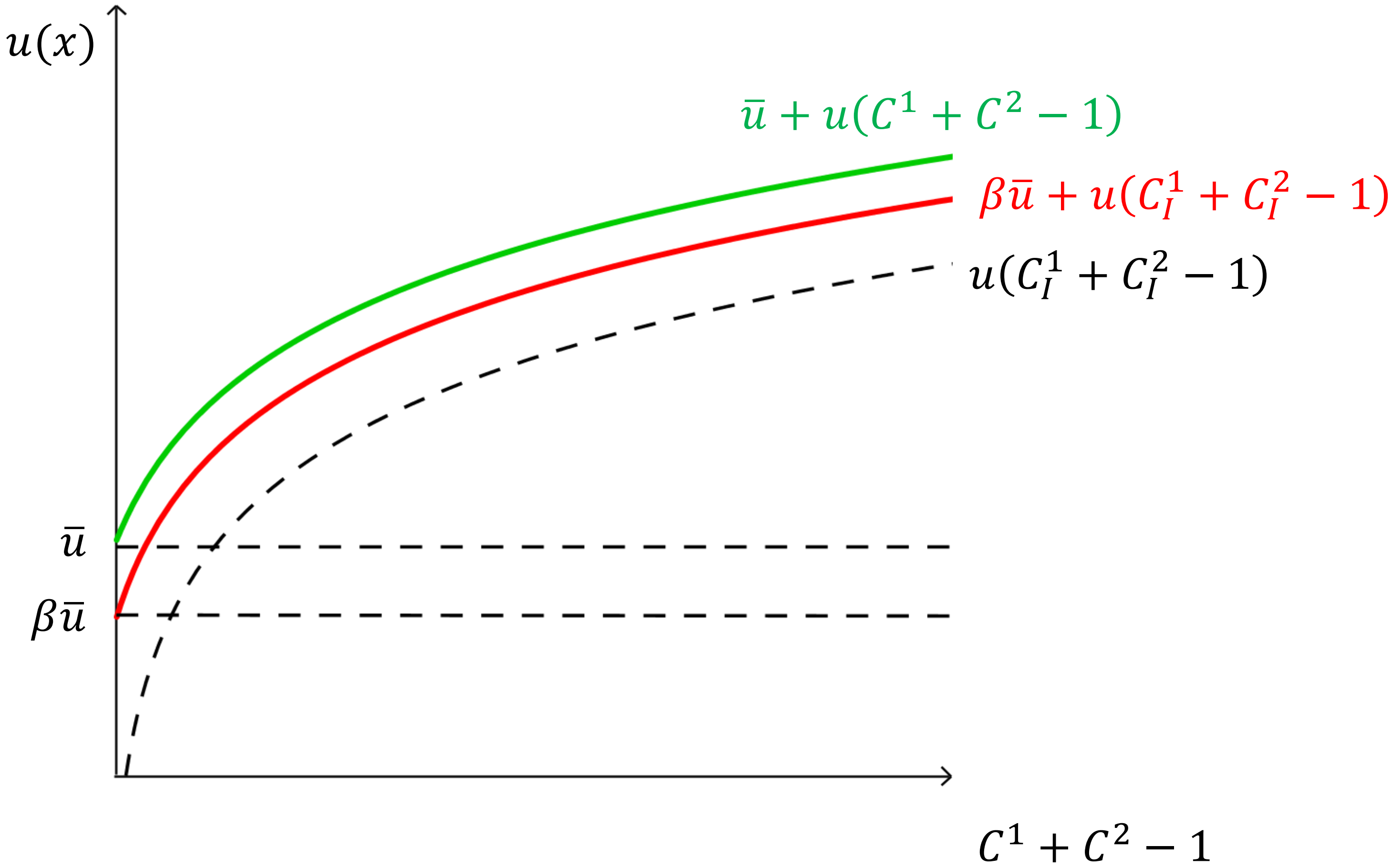
The utility functions



The utility functions



The utility functions



One more assumption

Constant-return-to-scale technologies

- i: illiquid (higher-yield technology)
- l: liquid (lower-yield technology)

$$1 < R_l < R_i$$

T:	0		1		2
i :	-1	$\longrightarrow$	$\longrightarrow$	$\longrightarrow$	R_i
l :	-1	$\longrightarrow$	1		
	-1	$\longrightarrow$	$\longrightarrow$	$\longrightarrow$	R_l

Recap (What's new?)

- $\alpha \backsim f_\alpha(\alpha) * 1_{[0,\overline{\alpha}]}(\alpha)$

- $U(x) = \begin{matrix} \overline{u} \\ \text{or} \\ \beta\overline{u} \end{matrix} \quad + \quad u(C^1 + C^2 - 1)$

- i (illiquid) returns R_i in $T = 2$
- l (liquid) returns R_l in $T = 2$

Banks

Separated system

(only l)

Unified system

(both l and i)

Contract

$$specifies \begin{cases} \gamma \\ c^1(z) \\ c_I^2(\alpha_1) \\ c_P^2(\alpha_1) \end{cases}$$

$\gamma =$ % of endowment in l

$c^1(z) =$ withdrawal in $T = 1$

$c_I^2(\alpha_1) =$ withdrawal in $T = 2$ if he also withdrew in $T = 1$

$c_P^2(\alpha_1) =$ withdrawal in $T = 2$ if he did not withdraw in $T = 1$

Welfare

No entry costs

⇩

Perfect competition

⇩

Maximize utility

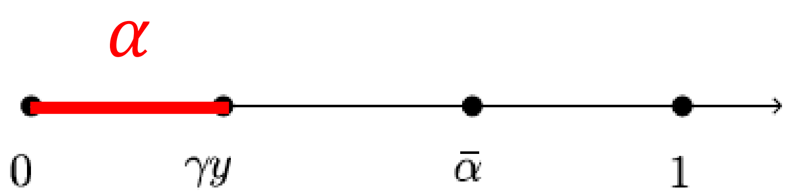
Welfare

Remarks:

- $c^1(z) = 1$ Maximum withdrawal in $T = 1$

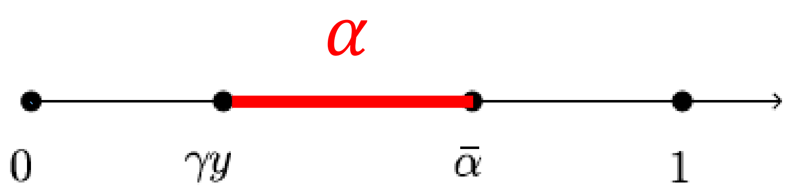
- $\gamma y \leq \bar{\alpha} * 1$ Maximum investment in l

Welfare



- $\alpha \leq \gamma y$ All impatient agents satisfied

Welfare



- $\alpha \leq \gamma y$ All impatient agents satisfied

- $\alpha > \gamma y$ Only γy impatient agents satisfied

Welfare

$$W = \int_0^{\gamma y} \left[\bar{u} + (1-\alpha)u\left((1-\gamma)yR_i + c_P^2(\alpha) - 1\right) + \alpha u\left((1-\gamma)yR_i + c_I^2(\alpha)\right)\right] f(\alpha)d\alpha +$$

$$+ \int_{\gamma y}^{\bar{\alpha}} [(1-\alpha+\gamma y)\bar{u} + (\alpha-\gamma y)\beta\bar{u} + (1-\alpha)u\left((1-\gamma)yR_i + c_P^2(\alpha) - 1\right) +$$

$$+(\alpha-\gamma y)u\left((1-\gamma)yR_i + c_P^2(\alpha) - 1\right) + \gamma y u\left((1-\gamma)yR_i + c_I^2(\alpha)\right)] f(\alpha)d\alpha$$

Welfare

Nobody is rationed

$$\int_0^{\gamma y} \{\alpha[\bar{u} + u(C_I^T)] + (1-\alpha)[\bar{u} + u(C_P^T)]\} f(\alpha) d\alpha$$

$\alpha[\bar{u} + u(C_I^T)]$: utility of all impatient agents

$(1-\alpha)[\bar{u} + u(C_P^T)]$: utility of all patient agents

Welfare

$(\boldsymbol{\alpha}-\boldsymbol{\gamma y})$ are rationed

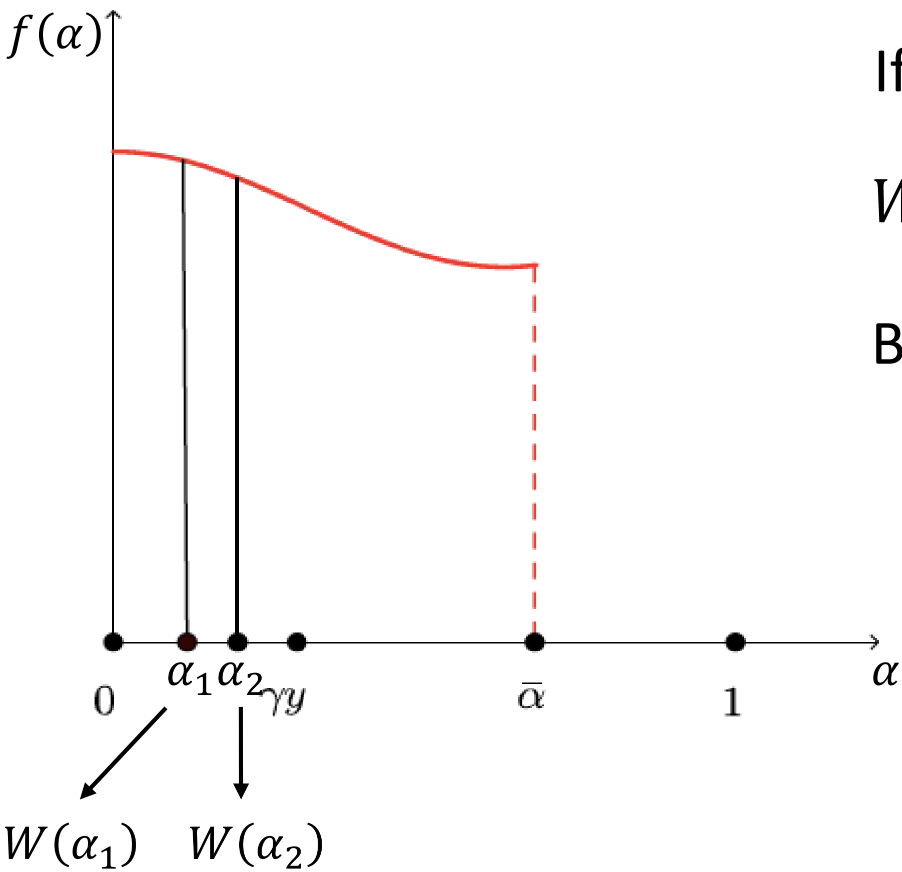
$$\int_{\gamma y}^{\bar{\alpha}}\{\gamma y[\bar{u}+u(C_I^T)]+(1-\alpha)[\bar{u}+u(C_P^T)]+(\alpha-\gamma y)[\beta\bar{u}+u(C_P^T)]\}f(\alpha)d\alpha$$

$\gamma y[\bar{u}+u(C_I^T)]$: utility of all satisfied impatient agents

$(1-\alpha)[\bar{u}+u(C_P^T)]$: utility of all patient agents

$(\alpha-\gamma y)[\beta\bar{u}+u(C_P^T)]$: utility of all rationed impatient agents

Welfare



If it was discrete:

$$W = W(\alpha_1)P(\alpha_1) + W(\alpha_2)P(\alpha_2) + \cdots$$

But it is continuous:

$$W = \int_0^{\alpha} \{\ldots\}\, f(\alpha) d\alpha$$

Constraints

Resource constraint (only l)

$$\alpha_1 c_I^2(\alpha_1) + (1-\alpha_1)c_P^2(\alpha_1) = (\gamma y - \alpha_1)R_l \qquad \alpha_1 \leq \gamma y$$

$$\gamma y c_I^2(\alpha_1) + (1-\gamma y)c_P^2(\alpha_1) = 0 \qquad \alpha_1 > \gamma y$$

Constraints

Resource constraint (only l)

$$\alpha_1 c_I^2(\alpha_1) + (1-\alpha_1)c_P^2(\alpha_1) = (\gamma y - \alpha_1)R_l \qquad \alpha_1 \leq \gamma y$$

$$\gamma y c_I^2(\alpha_1) + (1-\gamma y)c_P^2(\alpha_1) = 0 \qquad \alpha_1 > \gamma y$$

LHS: amount of withdrawals in $T = 2$

RHS: resources that can be withdrawn in $T = 2$

Constraints

Resource constraint (only l)

$$\alpha_1 c_I^2(\alpha_1) + (1-\alpha_1)c_P^2(\alpha_1) = (\gamma y - \alpha_1)R_l \qquad \alpha_1 \leq \gamma y$$

$$\gamma y c_I^2(\alpha_1) + (1-\gamma y)c_P^2(\alpha_1) = 0 \qquad \alpha_1 > \gamma y$$

$\alpha_1 c_I^2(\alpha_1)$: withdrawals of impatient agents in $T = 2$

$(1-\alpha_1)c_P^2(\alpha_1)$: withdrawals of patient agents in $T = 2$

Constraints

Resource constraint (only l)

$$\alpha_1 c_I^2(\alpha_1) + (1-\alpha_1)c_P^2(\alpha_1) = (\gamma y - \alpha_1)R_l \qquad \alpha_1 \leq \gamma y$$

$$\gamma y c_I^2(\alpha_1) + (1-\gamma y)c_P^2(\alpha_1) = 0 \qquad \alpha_1 > \gamma y$$

$\gamma y c_I^2(\alpha_1)$: withdrawals of satisfied impatient agents in $T = 2$

$(1-\gamma y)c_P^2(\alpha_1)$: withdrawals in $T = 2$ of who did not withdrawn in $T = 1$

Constraints

Resource constraint (only l)

$$\alpha_1 c_I^2(\alpha_1) + (1-\alpha_1)c_P^2(\alpha_1) = (\gamma y - \alpha_1)R_l \qquad \alpha_1 \leq \gamma y$$

$$\gamma y c_I^2(\alpha_1) + (1-\gamma y)c_P^2(\alpha_1) = 0 \qquad \alpha_1 > \gamma y$$

γy : total l invested

$\alpha_1 \cdot 1$: total amount of withdrawals of impatient agents in $T = 1$

R_l: returns on asset l

Constraints

Incentive compatibility constraint

$$\int_0^{\overline{\alpha}} u(C_P^2) f_p(\alpha) d\alpha \geq \int_0^{\overline{\alpha}} u(C_I^2) f_p(\alpha) d\alpha$$

Constraints

Incentive compatibility constraint

$$\int_0^{\overline{\alpha}} u(C_P^2) f_p(\alpha) d\alpha \geq \int_0^{\overline{\alpha}} u(C_I^2) f_p(\alpha) d\alpha$$

$u(C_P^2)$ = expected utility of a patient that does not withdraw in $T = 1$

$u(C_I^2)$ = expected utility of a patient that withdraws in $T = 1$

$f_p(\alpha)$ = density of α from a patient consumer's point of view

Maximization problem

$$\max_{\gamma,\ c_I^2(\alpha_1),\ c_P^2(\alpha_1)} \quad W$$

$$s.t. \quad (ICC)\ and\ (RC)$$

Results

THEOREM 3.1

A bank will never invest more than $\bar{\alpha}$ in l and there is full consumption smoothing

i) $c_I^2(\alpha_1) = c_P^2(\alpha_1) - 1$

ii) Optimal contract $\Longrightarrow \gamma y < \bar{\alpha}$

Results

PROOF

i) Maximizing W sub. only to the RC, we obtain:

$c_I^2(\alpha_1) = c_P^2(\alpha_1) - 1 \iff$ Consumption Smoothing (i.e. $C_P^{TOT} = C_I^{TOT}$)

Now,

$$\begin{cases} \text{RC} \\ \text{C.S.} \end{cases} \implies \text{ICC}$$

Results

PROOF

ii) Plugging RC and C.S. conditions in W

$$\left(\frac{\partial W}{\partial \gamma}\right)_{\gamma=\bar{\alpha}/y} < 0$$

Investing more than $\bar{\alpha}$ in l is sub-optimal

Results

THEOREM 3.2

i) There exists an optimal contract for the unified bank, also socially optimal

ii) Assuming that a patient does not run if indifferent,

$C_P^{TOT} = C_I^{TOT} \Longrightarrow$ NO RUN

Results

PROOF

i) Setting the RC and the C.S. to hold is sufficient for

$$\max_{\gamma,\, c_I^2(\alpha_1),\, c_P^2(\alpha_1)} W \quad \text{to have a solution}$$

ii) • Under the optimal contract $C_P^{TOT} = C_I^{TOT}$

• Patient agents are indifferent between running and not running

$\Longrightarrow$ No run equilibrium

Take-aways

- *“The unified system optimally resolves the trade-off between liquidity and economic growth; in doing so it maximizes social welfare”*

- *“Our Analysis in its present state does not prove that imposing Glass-Steagall restrictions would be a mistake, although it does suggest that one should be skeptical about the purported stability benefits. Before using the model to offer policy advise, moral hazard should be included.”*

Sources

- Peck, J., & Shell, K. (2010). Could making banks hold only liquid assets induce bank runs? *Journal of Monetary Economics, 57*(4), 420-427. doi:10.1016/j.jmoneco.2010.04.006
- Diamond, D. W., & Dybvig, P. H. (1983). Bank Runs, Deposit Insurance, and Liquidity. *Journal of Political Economy, 91*(3), 401-419. doi:10.1086/261155
- Experience News & Events. (n.d.). Retrieved November 12, 2016, from http://www.stern.nyu.edu/experience-stern/news-events/uat_025245
- Glass-Steagall Act: http://congressional.proquest.com:80/congressional/docview/t53.d54.00048-stat-0162-100089?accountid=10267