Notes on Disintermediation

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- 2-consumer model based on PS (JME)
- 2 financial systems
  - Unified (UB)
  - Separated (GSB)
- panic-based runs are sunspot-driven, PS(JPE), EK(EER)

Goals:

- Evaluate relative performances of UB, GSB, and autarky (A):
  - Consumer welfare
  - Run susceptibility
  - Disintermediation (i.e., bank is strictly inferior to autarky)
- Quantitative experiments:
  - Welfare gain (or loss) in terms of percent of endowment in moving from one regime to another.

Preview of Results:

- UB
  - not susceptible to panic-based runs
  - not susceptible to disintermediation
  - welfare non-strictly dominates GSB and A
- GSB
  - may be susceptible to runs
  - may be susceptible to disintermediation
  - calculated loss from GSB can be compared to costs of phenomena outside the model (e.g., moral hazard)

Consumption Opportunities

- Periods: $T = 0, 1, 2$
- Impatient I
  - Best in $T = 1$, $\overline{u}$
  - In $T = 2$, $\beta\overline{u}$, $0 < \beta < 1$
- Patient P
  - Best in $T = 2$, $\overline{u}$
  - P never chooses $T = 1$ (or $\beta\overline{u}$)
- Left over balances, $u(\cdot)$.
  - $u' > 0, u'' < 0$

The Model: Choice of investments

- Endowment $y \geq 1$
- $(1 - \gamma)$ is fraction of y invested in A, illiquid
- γ is fraction of y invested in B, liquid
- Aggregate endowment, $2y$
- Aggregate liquidity, $2\gamma y$
- Return on A: 0 of harvested early, R_A if harvested late
- Return on B: 1 if harvested early, R_B if harvested late
- $\Delta = R_A - R_B > 0$

Intrinsic Uncertainty (Types)

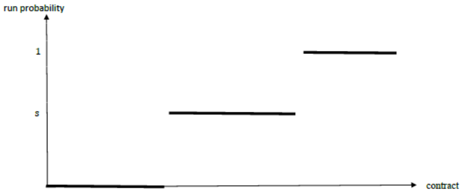
- There are 2 possible realizations, R1 and R2:
  - R1: There is one I and one P.
  - R2: There are 2 P's.
  - Prob(R1)$= q$, Prob(R2)$= (1 - q)$.
  - Given R1, the probability that a given consumer is I is $\frac{1}{2}$.
- Types are realized in $T = 1$.

Sequential Service

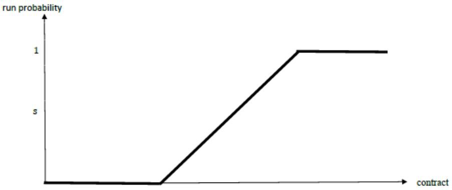
- Positions in queue are equally probable.
- Second in queue sees what first in queue chooses.
- Second in line can walk away.
- Strategic complementarity for all parameters.

Extrinsic Uncertainty (Sunspots)

- Sunspots, our focus today, PS(JPE)



- Sunspots, future work, inspired by EK(EER), e.g.



Timing

- $T = 0$
  - Government chooses UB or GSB, always allowing A.
  - Bank chooses portfolio and designs contract
  - Consumer chooses to deposit or not.
  - If consumer chooses A, he determines his portfolio.

T=1 and T=2

- Analyzing dynamic problem right-to-left.
- Characterize the set of parameters for which the consumer withdraws if he is able.
- An impatient who is able to withdraw at $T = 1$
  - prefers to withdraw in $T = 1$ to $T = 2$ iff

$$\overline{u} + u(yR_A - R_A) > \beta\overline{u} + u(yR_A - R_A + R_B - 1). \qquad (1)$$

  - prefers to withdraw in $T = 1$ rather than defer iff

$$\overline{u} + u(yR_A - R_A) > u(yR_A - R_A + R_B). \qquad (2)$$

T=1,2 con't

- An impatient who is *unable* to withdraw in $T = 1$, prefers $T = 2$ to defering iff

$$\beta\overline{u} + u(yR_A - 1) > u(yR_A). \tag{3}$$

- We analyze in our paper the set Z of parameter values satisfying inequalities (1)-(3). Z is the set of parameters in which liquidity would be chosen if types were known ex-ante.

T=1,2 con't

- Given the other parameter values, there is a critical value $\overline{u}_0$ such that for $\overline{u} > \overline{u}_0$ consumption opportunities are undertaken if the consumer is able to do so.
- $(1/\overline{u}_0)$ serves as a measure of *ideal* resource efficiency.
- If $\overline{u} < \overline{u}_0$, it is never worthwhile to hold the liquid asset.
- In what follows next, we assume that the parameter values lie in the set Z.
- Later we will analyze parameters outside Z.

Autarky (A)

- $W_1^A > W_0^A$ iff $\overline{u} > \overline{u}_4$, where W_i^A is expected utility when holding i units of the liquid asset, where $\overline{u}_4$ is the critical value.
- $\overline{u}_0 < \overline{u}_4$. Holding the liquid asset ex-ante is more costly than holding it ex-post (after the types are known).

UB

- To satisfy the consumption opportunity, UB needs to hold 1/2 unit of liquid asset per depositor.
- $W_{1/2}^{UB} > W_0^{UB}$ iff $\overline{u} > \overline{u}_1$, where $\overline{u}_1$ is the critical value.
- UB can pool the liquidity assets among the depositors. Therefore, it is less costly to satisfy the urgent consumption opportunity through UB than in autarky. That is, $\overline{u}_1 < \overline{u}_4$.

UB vs Autarky (A)

- $W_{1/2}^{UB} > W_1^A$ and $W_0^{UB} = W_0^A$.
- Let $W^{UB} = \max\{W_{1/2}^{UB}, W_0^{UB}\}$ and $W^A = \max\{W_1^A, W_0^A\}$, we have
  - $W^{UB} > W^A$ if and only if $\overline{u} > \overline{u}_1$.
- $\overline{u}_1$ is the threshold of $\overline{u}$ above which UB strictly dominates A.

GSB vs Autarky

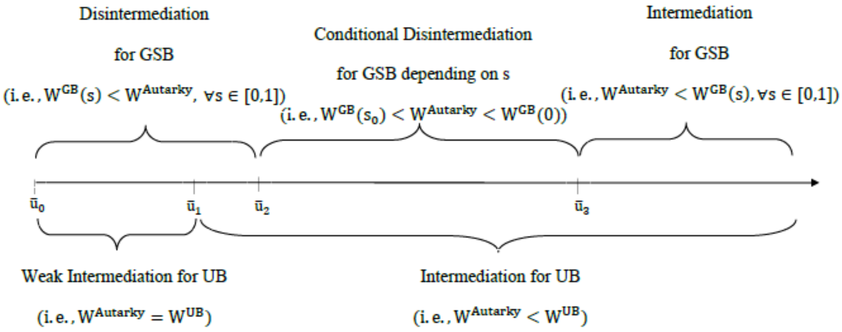
- Compared to UB, GSB is restricted by:
  - bank runs
  - ICC requires the bank to hold more than 1/2 unit of liquid asset per depositor.
- Bank runs make the expected utility of a depositor in GSB weakly decreasing in s.
- The minimum requirement of liquid asset holding makes GSB dominated by UB even if $s = 0$.
- Therefore, $W^{GSB}(s_0) < W^{GSB}(0) < W^{UB}$, where
  - $W^{GSB}(s)$ denotes the expected utility of a depositor when the sunspot-driven run probability is s.
  - s_0 denotes the threshold of s beyond which the GSB switches to the run-proof contract.

GSB vs A

- $$W^{GSB}(s) > W_1^A \text{ for all } s.$$
  - This is because the lower bound of $W^{GSB}(s)$ is $W^{GSB}(s_0)$ in which the contract is run-proof. And in the run-proof contract, the per person liquid asset holding is strictly smaller than 1.
- Therefore, whether disintermediation occurs depends on the comparison between $W^{GSB}(s)$ and W_0^A.

- $W^{GSB}(0) > W_0^A$ if and only if $\overline{u} > \overline{u}_2$, where $\overline{u}_2$ is the critical value.
- $W^{GSB}(s_0) > W_0^A$ if and only if $\overline{u} > \overline{u}_3$, where $\overline{u}_3$ is the critical value.
- We have $\overline{u}_2 < \overline{u}_3$. Each of these two thresholds is larger than $\overline{u}_1$. This is because $W^{GSB}(s_0) < W^{GSB}(0) < W^{UB}$.

Comparative Statics wrt $\bar{u}$

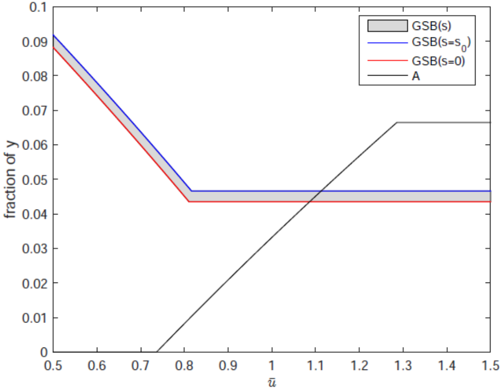


Numerical Example 1

- We calculate, for different values of $\overline{u}$, the fraction of endowment y a consumer would pay to become a depositor at the UB.
- The parameters: $\beta = 0.6$, $q = 0.5$, $y = 1.1$, $R_A = 1.5$, $R_B = 1.3$, $u(c) = \frac{(c+1)^{1-\theta}-1}{1-\theta}$, where $\theta = 2$.
- We calculate that $\overline{u}_0 = 0.4698$. We vary $\overline{u}$ from 0.5 to 1.5.

- UB is non-redundant ($W^{UB} > W^A$) if and only if $\overline{u} > \overline{u}_1 = 0.7366$.
- $W^{GSB}(0) > W_0^A$ if and only if $\overline{u} > \overline{u}_2 = 1.0862$.
- $W^{GSB}(s_0) > W_0^A$ if and only if $\overline{u} > \overline{u}_3 = 1.1127$.
- $W_1^A > W_0^A$ if and only if $\overline{u} > \overline{u}_4 = 1.2857$.

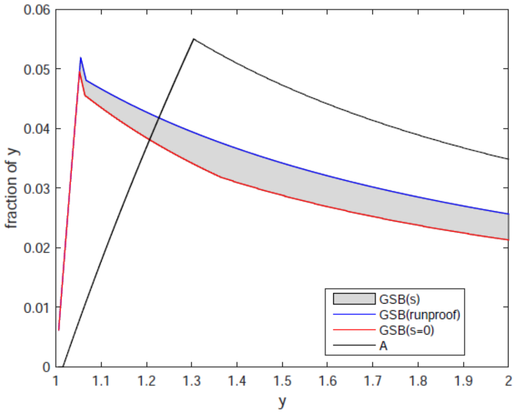
Numerical Example 1: Willingness to pay to move to UB



Numerical Example 2

- We plot the fraction of endowment that a consumers would pay to become a depositor of the UB.
- We fix $\beta = 0.5$. Other parameters are the same as the previous example.
- We vary y from 1 to 2. It can be verified that, for y in this range, the consumer will take advantage of the consumption opportunity if he is able to do so.

Numerical Example 2: Willingness to pay to move to UB



Numerical Example 3

- We plot the fraction of endowment that a consumers would pay to become a depositor in the UB.
- We fix $R_B = 1.3$. We vary Δ from 0.03 to 1.3.
- Other parameters remain the same as the previous example.

Numerical Example 3: Willingness to pay to move to UB