Securitized Lending: Adverse Selection and "Exuberance"

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AXA Conference, FMG/LSE 12/10

Goals of Modelling

- Lending by SR Institutions Funded with Short-maturity (Demandable) Finance
- Asset Trades (in part or whole) with LR Institutions having Long-maturity Claims
- Equilibrium Selection Dependent on the Prior Beliefs of Sellers re Benign States
- Potential Runs; Mitigating Regulations

Literature on Banks and Markets

- Bhattacharya-Gale (1987): Interim Inter-bank Borrowing and Lending, to cope with heterogeneous liquidity demand shocks
- Acharya, Shin, Yorulmazer (2010) and Stein (2010): Risky Long-term Assets funded by Shorter-maturity Debt; assets sold to Longer-maturity investors having lower valuation, in lower-return states

Main Lessons of Prior Papers

- Over-investment in Long-maturity (and Risky) assets, relative to a Second-best
- Due to Pecuniary Externalities arising in the Incomplete (interim) Market Settings
- Potential Regulatory Interventions in the Form of Leverage Restraints, or Taxes

Bolton, Santos, Scheinkman

- Asset Buyers assign Higher Valuation to their Future Payoff, in circumstances
- Which arise after an Aggregate average Payoff-reducing Shock, leading also to
- Heterogeneity among Subsets of assets vis- -vis their future payoff distributions
- Originator SRs become Better Informed

Time-State Event Structure

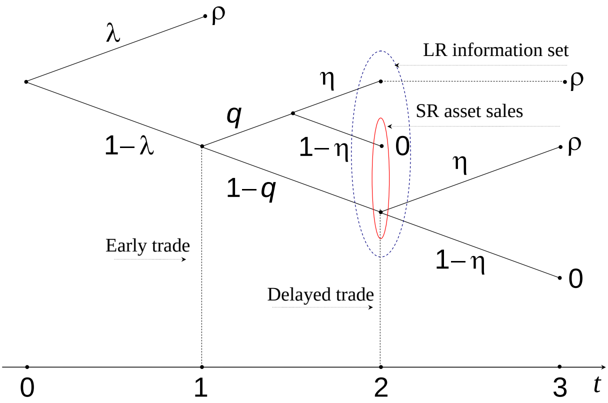


Figure: The Time Line of the Events.

Assumptions

A1. $[\lambda\rho + (1-\lambda)\delta\eta\rho] < 1$

A2. $[\lambda\rho + (1-\lambda)\eta\rho] > 1$

A3. $\dfrac{F'(K)-\lambda}{(1-\lambda)\eta\rho} < \dfrac{1-\lambda}{1-\lambda\rho}$, where, $F'(K) = \dfrac{dF(I)}{dI}$ at $I = K$

SR and LR Agents Choice Sets

- SRs: Unit Funding Capacity allocated to m in Liquid asset, $(1-m)$ in Risky asset subject to aggregate and private shocks
- LRs: Funding capacity of K allocated to I in Illiquid Long-term technology having gross Return $F(I)$, $dF/dI > 1$ for all $I < K$, and $M = (K-I)$ to Liquid Asset, usable for Buying SRs risky asset, at $t=1$ or $t=2$

Alternative Market Equilibria

- Early Trading: SRs sell All of their Risky Assets to LRs, after an aggregate shock
- Price P_e satisfies $M^* = [(1 - m^*)P_e]$, and
- Possibly, SRs Indifference condition for Liquid and Risky Investments, IF $m^* > 0$
- Delayed Trading: SRs sell only Subsets of Risky Assets, on which their Private Information is either Neutral, or Adverse

Bolton et al (2010) Findings

- Delayed trading equilibrium, IF it exists, Pareto Dominates Early trading payoffs; possibly weakly (SRs), or Strictly (LRs)
- Existence requires Akerlofian Lemons Discount in Delayed Price being Small, enough to elicit Sale of Average assets
- Regulatory Price Guarantee, to restore delayed trading, could improve welfare

Our Departure Point from BSS

- The Assumption, Key to their Welfare Ranking of Early vs Delayed Outcomes, that for asset subsets on which SR gets good news there is NO valuation wedge across SR and LR institutions, appears
- Dubious under Asymmetric Information
- As this wedge arises primarily from the difference in SR and LR liability structures

Implications for Asset Trading

- We assume, instead, that the SR vs LR proportional valuation wedge, following an adverse aggregate shock, is Same for All subsets of SRs assets, privately known to be of heterogeneous qualities
- As a result, SRs and LRs may Differ, in their preferred Choice over the Delayed vs Early trading equilibrium outcomes

Equilibrium Choice and Priors

- In particular, SRs may (strictly) prefer a Delayed trading outcome, but not LRs
- However, such preference requires that SR was sufficiently optimistic/exuberant about continuation of prior Benign state
- Immediate trading at $t = 0$, prior to the aggregate shock, is now possible, with
- Market Segmentation by Prior Beliefs

Structure of Early Equilibrium

Proposition 1: Bolton et al. *For all λ in $[\lambda_d, \lambda_u)$, an early trading equilibrium exists, with unit trading prices P_e, and liquidity holding levels $\{m, M_e^*\}$satisfying:*

(i) *For $\lambda < \lambda_c$, $m^* > 0$, $P_e(\lambda) = \dfrac{1-\lambda\rho}{1-\lambda}$, $M_e^* = (1-m^*)P_e$, satisfying equation:*

$$\frac{dF(I)}{dI} = \{\lambda + (1-\lambda)\frac{\eta\rho}{P_e}\}. \qquad (1)$$

(ii) *For $\lambda_c < \lambda < \lambda_u$, $m^* = 0$, and $M^* = P_e(\lambda)$, again satisfying equation (1)*

Early Trading: SR/LR Payoffs

Corollary 1: $M_e^*(\lambda)$ *is strictly increasing in* λ *at all* λ *in* $[\lambda_d, \lambda_c)$*, whereas it strictly decreases in* λ *for* λ *in* $[\lambda_c, \lambda_u)$*; that is also the case for LRs' expected payoff* $\Pi_{LR}(\lambda)$*.*

Early Trading: SR/LR Payoffs (cont'd)

Remark: The co-movement of the unit asset prices $P_e(\lambda)$, and LR money holdings $M_e^*(\lambda)$, across the set of early trading equilibria when λ is in $[\lambda_d, \lambda_c)$, may well be thought of as the inverse of "cash in the market pricing" – see Shin (2009) for its exposition - in that unit asset prices, and external (LR) liquidity holdings held in the anticipation of buying these assets following on an aggregate shock to their value, move in opposite directions as a function $(1-\lambda)$, the probability of such a shock. The reason, of course, is that m^* decreases, hence the quantity of the long- maturity asset supplied by SRs, $(1-m^*)$, increases strictly in λ, i.e., as the probability of the adverse aggregate shock decreases. However, SRs gain nothing from that enhanced surplus!

SR-preferred Delayed Trading

- Unlike in BSS, Delayed trading outcome is never Pareto-preferred by SR and LR

Lemma 1: *There does not exist a tuple of prices $\{P_e, P_d\}$, consistent with non-trivial early and late trading equilibrium, thus (weakly) exceeding $\delta\eta\rho$, such that both SR and LR agents prefer, even weakly, their delayed over their early trading payoff outcomes.*

Lemma 2: *SRs would never strictly prefer a Delayed trading equilibrium in which $m^* > 0$, over any early trading equilibrium. Such a delayed equilibrium would also make LR agents strictly worse off than in early trading - unlike as in Bolton et al (2010).*

Needs High Initial Optimism

- Necessary Condition for an SR to prefer her expected Payoff in Delayed trading, over that in Early Equilibrium with $m^* > 0$:

Lemma 3: *Define the "social surplus" per unit of the SR-created long-maturity asset,*

$$S(\lambda) = [\lambda\rho + (1-\lambda)\eta\rho - 1]. \tag{2}$$

A necessary condition for the existence of a delayed trading equilibrium with $m^* = 0$ is

$$S(\lambda) > (1-\lambda)q^2 \frac{1-\eta}{1-q\eta}\eta\rho. \tag{3}$$

Delayed: Sufficient Conditions

Proposition 2: *Condition (3) above, together with the condition in inequality (5) below, are necessary and sufficient for the existence of a delayed trading equilibrium in which m^*, the liquid asset holdings of the selling SR agents, equals zero. Defining:*

$$P_{\min} = \frac{P_e(\lambda)}{1 + q(1-\eta)}, \tag{4}$$

$$\frac{dF(I = K - (1 - q\eta)P_{\min})}{dI} < \left[\lambda + (1-\lambda)\frac{(1-q)\eta\rho}{(1-q\eta)P_{\min}}\right]. \tag{5}$$

Delayed: Sufficient Conditions (cont'd)

Moreover, there exist upper and lower bounds on δ, given by:

$$\delta^*(\lambda) = \frac{x}{\eta\rho}, \qquad \delta_*(\lambda) = \max\left\{\frac{x}{\rho}, \frac{P_e(\lambda) - (1 - q\eta)x}{q\eta\rho}\right\}, \tag{6}$$

where x solves a nonlinear equation

$$\frac{dF(I = K - (1 - q\eta)x)}{dI} = \lambda + (1 - \lambda)\frac{\eta\rho(1 - q)}{(1 - q\eta)x}, \tag{7}$$

such that for all pairs $\{\lambda, \delta\} \in \Big\{\{\lambda, \delta\} : \delta_*(\lambda) \leq \delta \leq \delta^*(\lambda)\Big\}$ there exists a unique delayed equilibrium with $m^* = 0$ and price $P_d = x \geq P_{\min}$ which SRs prefer to an early equilibrium with price $P_e(\lambda)$.

Parametric Numerical Results

- We assume

$$F(I) = \frac{K^{1-\alpha} I^{\alpha}}{\alpha},$$

  where $\alpha \in (0, 1)$.

- Consider an example with parameter values: $K = 2$, $\rho = 1.2$, $\eta = 1/\rho$, $q = 0.3$, and $\alpha = 0.75$.

Figure: Existence Regions

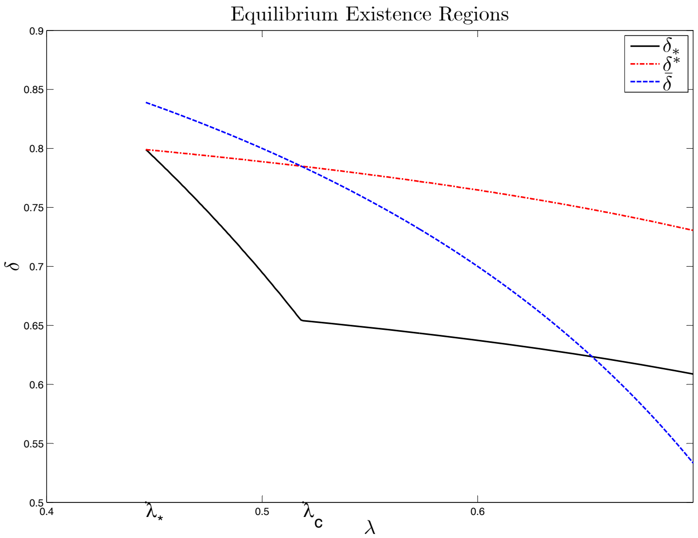


Figure: Switch Points and $F(\cdot)$

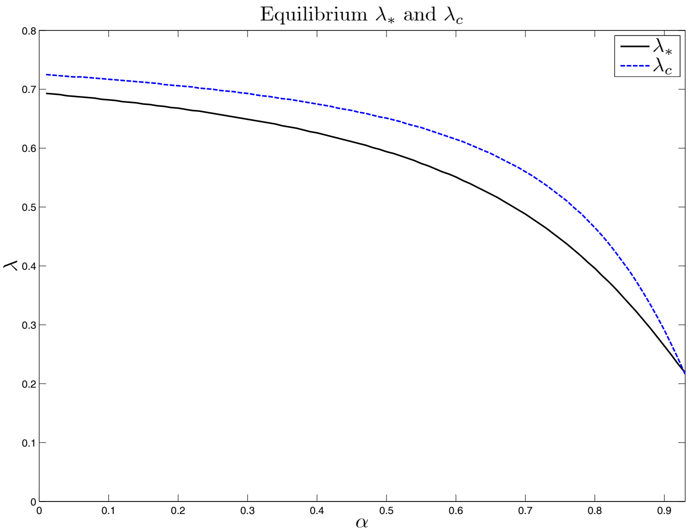
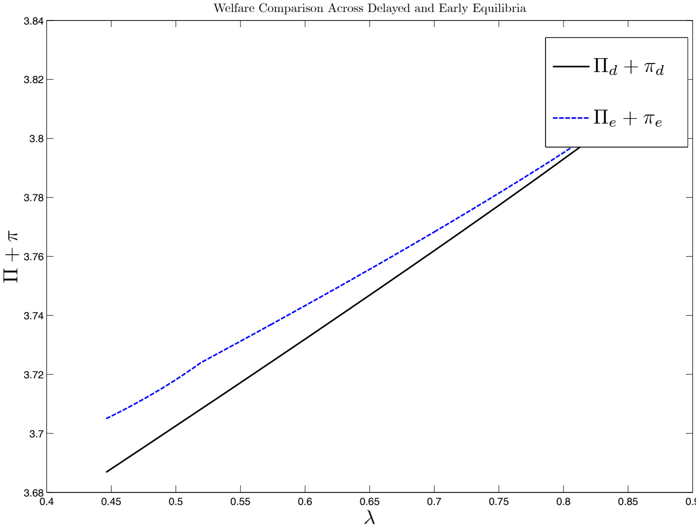


Figure: Aggregated Payoffs



Delayed is Not Strategy-proof

Lemma 4: *Given a Delayed trading equilibrium price* P_d, *there is always an Early trade price offer by an LR of* $P_o > q\eta\delta\rho + (1 - q\eta)P_d$ *- that makes both her and her SR trading partner strictly better off, via exchanging an unit of the asset at this price.*

Prior Beliefs and Segmentation

- *Example:* $\rho = 1.20$, $\eta\rho = 1$, $\alpha = 0.87$, $\delta = 0.84$, $q = 0.3$, and P_d is such that $q\eta\delta\rho + (1 - q\eta)P_d$ is between .892 and .9.
- LR agents, and some SRs as well, believe that the ex ante probability of the benign state continuing is $\lambda_p = .35$, whereas as other "exuberant" SR agents believe that it is $\lambda_o = .45$.
- Both beliefs are consistent with the conjecture that SR agents would prefer to trade in a price-taking Delayed equilibrium over an Early trading one, as $P_e(\lambda_p) = [1 - (1.2)(.35)/(1 - .35)] = 0.892 < .9$.
- Suppose that LR agents are willing to offer SR agents the equivalent of an early trading price of

Prior Beliefs and Segmentation (cont'd)

- The exuberant SR agents would prefer not to sell immediately at this price, as they conjecture that if they wait and then trade in a Delayed equilibrium, at the price P_d, if and when the aggregate shock would occur, they would obtain the ex ante (at $t = 0$) expected payoff of
  $(.55)(1.20) + (.45)(.892) = 1.03 > 1.02,$
  their offered immediate trading price.
- This gives rise to a market segmentation whereby assets are traded at both $t = 0, 2$. Indeed, one may think of the post aggregate but pre idiosyncratic private information state $t = 1$, as a conceptual rather than a "real time" state, when trading is carried out.

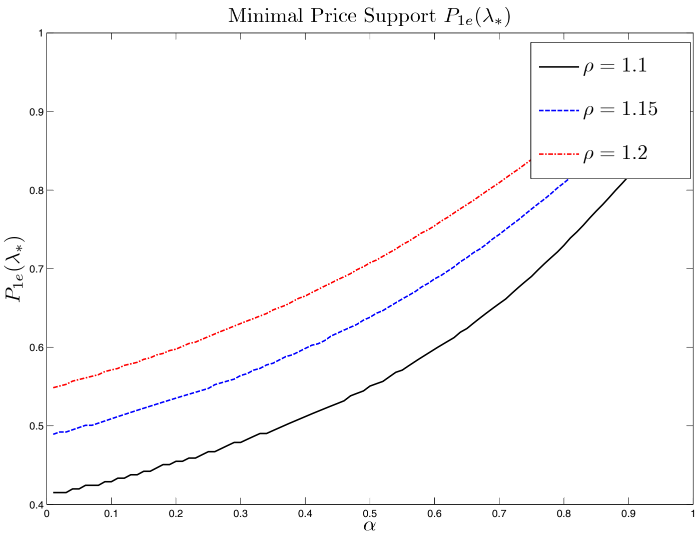
Leverage Choices and Crises

- IF, based on an immediate trading price of 1.02 at t = 0, optimistic SRs take on a .99 leverage level per unit of risky asset funded via demandable Repo debt, and
- Pessimistic LRs lower their belief about likelihood of the ex ante state lasting to .25, leading to an Immediate Offer Price .25(1.2) + .75(.92) = .99, hence Runs

Two Regulatory Interventions

- Maximum Leverage Restrictions: Would attempt to ensure (insure against hubris re trading) that SRs Debt is rolled over, with post-shock pledgeable asset value
- Note that the latter is strictly Decreasing in agents prior beliefs regarding benign aggregate state continuing, for $L > L^*$

Illustrations of Price Supports



Minimum Early Price Guaranty

- Eliciting sales of SR agents portfolio as a whole, at the Early trading equilibrium price $P_e(L^*)$, will do more than ensure safety with No Runs. It will also lead to
- SR and LR coordinating on Early trade, thus enhancing LRs equilibrium payoffs
- Require Equity Stakes to Avoid Lemons

New Perspective on Policies?

- Traditionally, capital/leverage restraints are thought of as micro-prudential, asset price supports as macro-prudential, in response to systemic fire sale inducing valuation shock
- Here, asset price supports are better in terms of creating ex ante (micro) incentives, while
- Leverage controls lower SRs funding capacity relative to LRs absorption capacity, thereby making Early trading outcome more attractive

Conclusion