Dynamic Asset-Backed Security Design

Discussion of Ozdenoren, Yuan, Zhang

by Saki Bigio (UCLA)
on May 27, 2021

Introduction

> Overview

* Comment: view paper as static security design w/ long-lived assets
    * dynamic security in the spirit of dynamic contracts

> Overview

* Comment: view paper as static security design w/ long-lived assets
  * dynamic security in the spirit of dynamic contracts
* Beautiful Economics
  * feedback: future prices to extent of asymmetric information
* Discussion
  * simplify/clarify model
  * discuss features

> Paper

* Models of private information in financial market:

Market Structure \ Security	One Period	Long-Lived
Spot Market	Akerlof '71	This paper
Security Design	DeMarzo-Duffie '00	This paper

* Embedded funding friction
  * Kiyotaki & Moore, Kurlat, Bigio
  * investigate stability when asset is long-lived
  * market structure

Simplified Model

> Core Model

* Holmstrom-Tirole notation

> Core Model

* Holmstrom-Tirole notation

* Population
    * entrepreneur: linear U, long-lived discount β, specialist,
    * investor: linear U, live one period, OLG, deep pocket

* Asset

> Core Model

* Holmstrom-Tirole notation

* Population
  * entrepreneur: linear U, long-lived discount β, specialist,
  * investor: linear U, live one period, OLG, deep pocket

* Asset
  * Lucas tree
  * State: $Q \in \{L, H\}$
  * Fruit: $s(H) > s(L)$
  * Symmetric Markov chain:

$$P = \begin{bmatrix} p & 1-p \\ 1-p & p \end{bmatrix}$$

  * Unconditional prob: 1/2

> Timing + Information

* Market design
    * once at time 0

> Timing + Information

* Market design
  * once at time 0

* Each period t, two stages
  * contracting stage
    * matched
    * agents can opt out
    * entrepreneur: exploits private information
  * settlement, resell
    * investor paid
    * if ends with collateral, resells at spot market

> Timing + Information

* Market design
  * once at time 0

* Each period t, two stages
  * contracting stage
    * matched
    * agents can opt out
    * entrepreneur: exploits private information
  * settlement, resell
    * investor paid
    * if ends with collateral, resells at spot market

* Investment opportunity
  * great return $\rho > 1$
  * but not too much, $\rho < 2$

> Spot - Short Lived

Market Structure \ Security	One Period	Long-Lived
Spot Market	Akerlof '71	This paper
Security Design	DeMarzo-Duffie '00	This paper

> Classic Akerlof

* Assume $\beta = 0$
* In a pooling equilibrium
* Good asset sold if:

$$\rho \mathbb{E}[s] - s(H) > 0$$

* Otherwise, market unravels (not separates)
  * single “static” equilibrium
  * depends on “information sensitivity”

> Spot - Short Lived

Market Structure \ Security	One Period	Long-Lived
Spot Market	Akerlof '71	This paper
Security Design	DeMarzo-Duffie '00	This paper

> Classic Akerlof + long-lived asset

* Assume $\beta > 0$

* Asset price is

$$\phi(Q)$$

* Good asset sold if:

$$\rho \mathbb{E}[s + \phi] > s(H) + \phi(H)$$

* Re-arranging condition:

$$\rho \underbrace{(\mathbb{E}[s] - s(H))}_{\text{Akerlof condition}} + \rho \underbrace{(\mathbb{E}[\phi] - \phi(H))}_{\text{price condition}} > 0$$

> Classic Akerlof + long-lived asset

* Observation
  * Akerlof condition may fail

$$\rho \underbrace{\left(\mathbb{E}\left[s\right] - s\left(H\right)\right)}_{\text{Akerlof condition}} < 0$$

  * still, prices may sustain equilibrium if:

$$\rho \underbrace{\left(\mathbb{E}\left[\phi\right] - \phi\left(H\right)\right)}_{\text{price condition}} >> 0$$

* Multiplicity: strategic complementarity

> long-lived asset

Strategic complementarity

* If market illiquid:
  * Lucas price:

$$\phi(Q) = \mathbb{E}\left[\sum_t \beta^t s_{+t} | Q\right]$$

  * high information sensitivity $\Longrightarrow$ illiquid market

* If market liquid:
  * conjecture constant resale price

$$\phi = \frac{\rho \overbrace{\mathbb{E}[s]}^{\text{fund}} + \overbrace{(\rho - 1)\phi}^{\text{buy sell}}}{1-\beta}$$

  * no information sensitivity $\Longrightarrow$ liquid market

> Classic Akerlof + long-lived asset

Compstats:

- Recall need

$$\rho \underbrace{\left(\mathbb{E}\left[\phi\right] - \phi\left(H\right)\right)}_{\text{price condition}} >> 0$$

- Higher β helps scale up price relative to s
- Persistence p creates greater sensitivity

> Spot - Short Lived

Market Structure \ Security	One Period	Long-Lived
Spot Market	Akerlof '71	This paper
Security Design	DeMarzo-Duffie '00	This paper

> Security Design

* Market unravels if Akerlof condition fails

$$\rho\mathbb{E}[s] - s(H) < 0 \implies s(L) < \underbrace{\Lambda}_{\equiv\left(\frac{2}{\rho}-1\right)} s(H)$$

> Security Design

* Market unravels if Akerlof condition fails

$$\rho\mathbb{E}\left[s\right] - s\left(H\right) < 0 \implies s\left(L\right) < \underbrace{\Lambda}_{\equiv\left(\frac{2}{\rho}-1\right)} s\left(H\right)$$

* This sucks!
  * lose ability to invest in good state

> Security Design

* Clever idea: security design
    * issue debt D
    * default if $s < D$

> Security Design

* Clever idea: security design
  * issue debt D
  * default if $s < D$

* Collateralized
  * Akerlof condition:

$$s(L) = \Lambda \cdot D$$

  * sold at:

$$q = \frac{1}{2}\left(s(L) + D\right)$$

  * Self financed:

$$D < s(H)$$
$$s(L) = s(L)$$

> Spot - Short Lived

Market Structure \ Security	One Period	Long-Lived
Spot Market	Akerlof '71	This paper
Security Design	DeMarzo-Duffie '00	This paper

> Security Design

* Condition :

$$s(L) + \phi(L) < \Lambda(s(H) + \phi(H))$$

> Security Design

* Condition :

$$s(L) + \phi(L) < \Lambda(s(H) + \phi(H))$$

* Same principle

* Uniqueness
    * Always issue debt
    * Constant price: q
    * Per unit return is unique

$$\phi = \frac{\rho q}{1 - \beta}$$

Comments

> Some Comments

* Comment 1:
  * security design assumes ex-ante commitment
  * fine only in some market
  * Bigio-Shi (2020) with ex-post competition
    * curious to see dynamics there

* Comment 2:
  * Message here: securitization reduces volatility
  * but Brunnermeier-Pedersen
    * asset-backed securities
    * re-hypothecation: generates large spirals
    * amplification of aggregate shocks
    * tail events provoked by leverage
  * curious to know if you could build both