

Risk-Taking Dynamics and Financial Stability

An Evolutionary Perspective

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Motivation:

- Traditional focus of macroprudential research: factors behind booms and busts for financial sector as a whole
 - e.g. sector-wide/aggregate distortions like exuberance, agency problems, externalities, ...
- This paper: focus instead on composition of the financial sector
 - booms and busts accompanied by growth and demise of high risk-takers
 - examples in 2000s: Countrywide, WaMu, AIG Fin Services, ...

- **Composition of financial sector** matters for macro phenomena:
 - drives pro-cyclicality: during booms, high risk-takers take over
 - captures important aspect of Minsky's financial instability hypothesis
 - **Novel dynamic selection effects of policy intervention:**
 - stem from evolutionary forces rather than optimizing behavior
 - neglected in traditional (rep. agent) analysis
- role for non-conventional policy measures, e.g.:
growth limits, stress tests, ...
- novel adverse selection effects of bailouts
- ...

- **Role of net worth in financial sector**, e.g. Gertler-Kiyotaki (2010), Gertler-Karadi (2011), Brunnermeier-Sannikov (2014), ...
→ we introduce heterogeneity in financial sector
- **Net worth dynamics of heterogeneous agents**, e.g. beliefs (Blume and Easley, 1992; Geanakoplos, 2009; Burnside et al., 2015), preferences (Borovicka, 2015), ...
→ we focus on financial sector and impact of financial policy
(most closely related: Coimbra and Rey, 2017)
- **Booms and busts**, e.g. Minsky (1986), Kiyotaki-Moore (1997), ...
→ we provide a novel, complementary explanation

- $i = 1 \dots N$ types of bankers with log preferences

$$U_i = \sum \beta^t \mathbb{E} [\log c_{it}]$$

unit mass of agents each with initial endowment k_{i0}

- Each type chooses from a set of investment strategies each period
 - a strategy S_{it} delivers stochastic return $\tilde{R}(S_{it})$
 - return depends on aggregate state of nature $\omega \in \Omega$, independent over time

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- Different interpretations for set of investment strategies:
 - different leverage strategies: e.g. $\tilde{R}(S_{it} = x) = xr + (1 - x) \tilde{R}_t$
 - differences in diversification

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- Extensions (later): differences in beliefs $\mathbb{E}_i[\cdot]$, discount factors β_i

$$\max_{c_{it}, k_{it}, S_{it}} \mathbb{E} \left[\sum_t \beta^t \log c_{it} \right] \quad \text{s.t.} \quad c_{it} + k_{it+1} = \tilde{R}_t(S_{it}) k_{it}$$

Lemma (Optimal Strategy under Laissez-Faire)

- *investment strategy S_{it} is time-invariant and independent of wealth; it maximizes geometric mean return each period*
- *unless there is complete risk-sharing, capital shares of different types fluctuate over booms and busts*

Example of two-state economy $\omega \in \{L, H\}$

Example (Volatility and Procyclicality in Two-State Economy)

Volatility: The more risky the wealth distribution of bankers, the greater the n-period-ahead volatility of aggregate wealth.

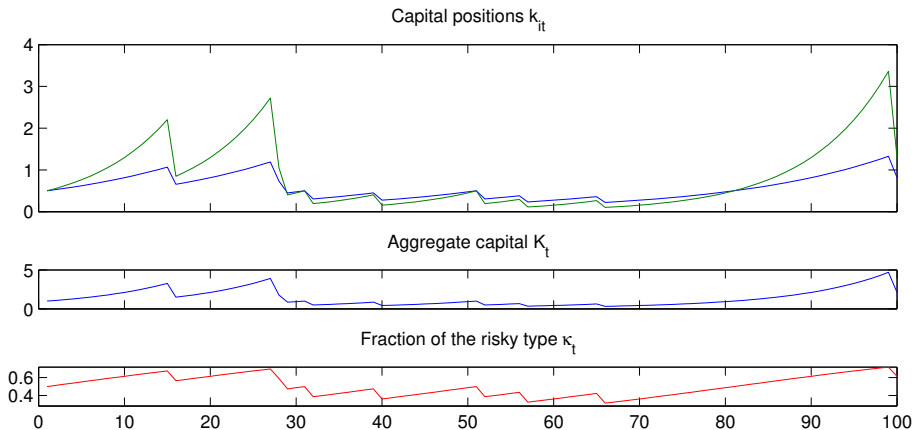
Pro-cyclicality: The more positive shocks the economy experiences,

- the greater the n-period-ahead volatility of aggregate wealth and
- the greater the loss from a negative shock.

→ Minsky's financial instability hypothesis

→ Observation: capital shares $\kappa_{it} = k_{it} / \sum_i k_{it}$ fluctuate pro-cyclically

Simulation 1: Volatility and Procyclicality



Planner allocates capital and consumption and picks investment strategies

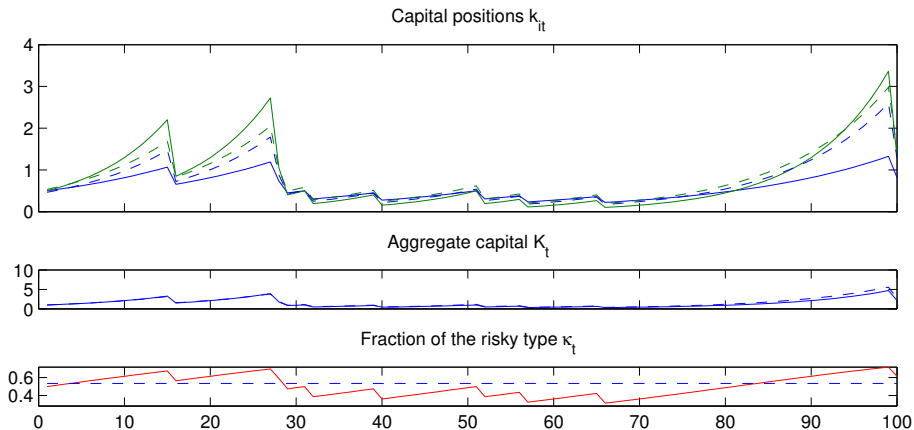
Proposition (First Best)

- 1 *Planner chooses time-invariant capital shares κ_i^* and investment strategies S_i^**
- 2 *Economic growth is a.s. faster than in the decentralized economy.*

Note: first best solves [static] portfolio allocation problem

- social pricing kernel λ^* does not change over time
- overcomes the imperfections in risk markets

Simulation 1': Dynamics of First-Best Capital Allocation



Constrained Planning Problem

Planner who respects internal capital accumulation

Proposition (Constrained optimum in private ownership economy)

- 1 *Planner chooses time-varying investment strategies S_{it} that are counter-cyclical*
- 2 *Economic growth is a.s. in between decentralized economy and first-best.*

Note:

- social pricing kernel λ_t more risk-averse (risk-loving) if more capital held by risky (safe) types
- may justify both taxes and subsidies on strategies such as leverage, diversification etc.

Implementing a more stable capital allocation

Proposition (Effects of Financial Regulation)

Restricting risk-taking in a given period t leads to:

- a **static effect** on period t volatility from restricting the choice set and
- a **dynamic selection effect** from changing the wealth composition in all future periods, which
 - reduces volatility if the period t shock is positive
 - increases volatility if the period t shock is negative

→ the dynamic effect of regulation is inherently counter-cyclical

Role for unconventional policy instruments:

- limits on growth
- stress tests
- ...

Proposition (Effects of Government Policies)

*Any government policy that differentially affects different risk types has **dynamic selection effects**.*

Examples:

- support for home ownership among low-income individuals:
→ selects for institutions specializing in subprime
- bailouts: usually occur after high risk-takers make large losses
→ select for high-risk strategies
- monetary policy: low interest rates select for high-leverage strategies
→ “risk-taking channel” of monetary policy

Reallocations of capital among different types:

- allows for richer dynamics than purely internal net worth accumulation
- captured by transition matrix $M = (m_{ij})$,
where m_{ij} is fraction of type i capital reallocated to type j each period

Interpretations:

- 1 changes in type of a given financial institution
 - via change in management, personnel, internal decision-makers, information, ...
- 2 changes in set of financial institutions who are operating
 - via mergers, take-overs, firm entry and exit
- 3 reallocations due to public policy actions
- 4 (more broadly) reallocations of internal funds by external investors

Examples:

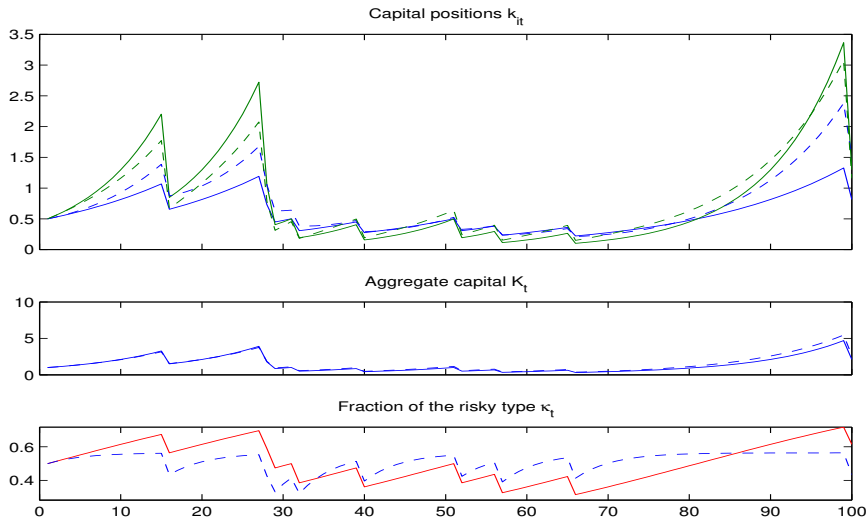
- symmetric reallocation: M non-stochastic and symmetric
- momentum: reallocates towards recent winners
- reversal: reallocates towards recent losers

Proposition (Effects of Capital Reallocation)

A small amount of reallocation that is

- (i) symmetric: increases the growth rate of the economy a.s.*
- (ii) momentum-based: reduces the growth rate of the economy a.s.*
- (iii) reversal-based: increases the growth rate of the economy a.s.*

Simulation 2: Symmetric Reallocation



Extension to capture spillovers to the real economy

- Unit mass of workers:
 - same (log) utility as bankers
 - supply one unit of labor
 - live hand-to-mouth so $c_t = w_t$,
- after shock realization, capital k'_{it} lent to real economy for production

$$y_{it} = Ak'_{it}{}^{\alpha} \ell_{it}^{1-\alpha}$$

- Equilibrium wage satisfies $w_t = (1 - \alpha)AK'_t$

Observe: Workers care about stable supply of risk capital

Proposition (Spillovers)

- 1 *Aggregate bank capital creates spillovers to the real economy.*
- 2 *The results on (a) procyclicality and (b) optimal capital allocation continue to hold.*

Role of Financial Regulation:

- ensure stable supply of capital to the real economy
- desirable to stabilize capital shares of different investment technologies
- output and wages less volatile
- output and wages on average higher

Bailouts

- workers benefit from providing bailout transfers to bankers when capital falls below a threshold \hat{K}

Proposition (Bailouts and Natural Selection)

The introduction of lump-sum bailouts

- increases the fraction of capital controlled by high risk-types*
- allows for long-run survival of inferior risk types (that would otherwise go extinct)*

Conclusions

- Heterogeneity in risk exposure creates novel channel that drives the riskiness of the aggregate economy
- Pro-cyclicality
- Policy interventions have dynamic selection effects
 - Question: which financial institutions will benefit?
- Role for smoothing cycles – in both directions