Booms and Busts in Segmented Asset Markets

Martin Schneider

FRB Minneapolis, NYU & NBER
Motivation

- Large price movements in US stock, housing markets in last 10 years.
- Lack of diversification.
- Large changes in participation rates.
- Should we care about the extensive margin?
- How far should we disaggregate agents, assets?
Summary

• Analytical framework
  – focus on historical trading periods
  – distinguish two aspects of household positions
    – investment behavior (conditional on participation):
      savings rate, portfolio weights
    – participation patterns
  – link aggregate asset values, household net worth to changes in both

• Empirical study of booms and busts 1995-2004
  – consider stocks, housing, bonds
  – measure investment behavior and participation patterns from micro data
  – decompose booms and busts

⇒ Stock boom & increase in aggregate wealth/GDP (90s):
   jump in savings rates + individual weights on stocks,
   reinforced by more stock participation

⇒ Housing boom & decline in aggregate wealth/GDP (2000s):
   drop in savings rates + higher indiv. weights on housing (esp. by young),
   partially offset by more stock participation, more high-rate savers (esp. old).
Outline

- **Analytical framework**
  - General valuation formula:
    - link prices to portfolio weights, savings rates, participation patterns.
  - Examples: extreme participation patterns

- **Empirical study of booms and busts 1995-2004**
  - Definitions & facts on stocks, bonds, housing.
  - Changes in investment behavior, participation patterns from SCF
  - Decomposing asset prices
Analytical framework

- Single trading period $t$.

- Assets $a$
  - one unit outstanding, trades at price $p^a_t$
  - pays dividends at $t$.

- Agent types $i$
  - $i$ participates in a subset of markets.
  - summarize $i$’s dividends and labor income by $E^i$
  - $i$ also endowed with assets $\bar{\theta}^i_a$
  - $i$’s initial wealth (cash on hand): $\bar{w}^i = \sum_a p'_a \bar{\theta}^i_a + E^i = p'\bar{\theta}^i + E^i$
  - $i$’s decisions summarized by
    savings rate $s^i$ (out of initial wealth; consumption in $t = (1 - s^i) \bar{w}^i$
    portfolio weights $\alpha^i = (\alpha^i_1, \ldots, \alpha^i_a, \ldots)'$

(benchmark: log utility; $s^i$ captures age, $\alpha^i$ expectations)
Market clearing and valuation

- **Market clearing**

  \[
  \sum_i \alpha^i a^i \bar{w}^i = p_a \quad \text{for all } a
  \]

- **Using definition of wealth** \( \bar{w}^i = p^i \bar{\theta}^i + E^i \),

  \[
  p = \left( I - \sum_i \alpha^i s^i (\bar{\theta}^i)' \right)^{-1} \sum_i \alpha^i s^i E^i
  \]

- **Valuation**

  - individual behavior \((s^i, (\alpha^i))\), distribution of endowments, income \(((\bar{\theta}^i), E^i)\)
  - total endowment \(\bar{\theta}^i := \sum_i \bar{\theta}^i = \text{insiders' (current decision makers') share}\)
    - \(\bar{\theta}^i < 1\) if insiders buy from someone else (e.g. other sectors, generations)
    - \(\bar{\theta}^i > 1\) if insiders sell, e.g. to foreigners.
    - short bonds have \(\bar{\theta}^i = 0\), payoffs in \(E^i\).
  - $$, not people!
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One Agent, One Asset

- Market clearing
  \[ s\bar{w} = p \]

- Using definition of wealth \( \bar{w} = p\bar{\theta} + E \),
  \[ p = \frac{s}{1 - s\bar{\theta}}E \]

- Value of asset
  - proportional to income
  - increasing in savings rate
  - increases in insider share
  - tree economy, no risk:
    - infinitely-lived agent \( (\bar{\theta} = 1) \), with log utility:
      \[ s = e^{-\delta}, E = C \implies p \approx \frac{C}{\delta} = \frac{C}{r-g}. \]
    - 2-period lives OLG \( (\bar{\theta} = 0) \): \( p = sE \).
Segmented Markets

- Market clearing with one agent $a$ per asset $a$
  \[ s^a w^a = p_a, \quad \text{for all } a \]

- Using definition of wealth $\bar{w}^a = p_a \bar{\theta}^a + E^a$,
  \[ p_a = \frac{s^a}{1 - s^a \bar{\theta}_a} E^a \]

- Household sector net worth
  \[ NW = \sum p_a = \left( \sum \frac{s^a}{1 - s^a \bar{\theta}_a} \frac{E^a}{E} \right) E \]

- Asset values and net worth
  - distribution of income across types matters.
  - NW increases as more income shifts to markets with higher insider share
    - example: moving to the coasts
Two Integrated Markets (One Agent)

- Market clearing
  \[ \alpha_a s \bar{w} = p_a, \quad \text{for all } a \]

- Using definition of wealth \( \bar{w} = p'\bar{\theta} + E \),
  \[ p_a = \frac{\alpha_a s}{1 - \alpha_1 s \bar{\theta}_1 - \alpha_2 s \bar{\theta}_2} E \]

- Household sector net worth
  \[ NW = \sum p_a = \frac{s}{1 - \alpha_1 s \bar{\theta}_1 - \alpha_2 s \bar{\theta}_2} E \]

- Asset values and net worth
  - agents’ taste for individual assets matters.
  - NW increases as more taste for markets with higher insider share
    - example: NW moves with stocks and housing
Partial Segmentation

• Suppose one short asset connects all agents
  – captures several interesting settings
  – income shares still matter with partial segmentation, but tastes matter as well.
  – spillover effects under integration:
    insider share, taste for asset 2 raises value of asset 1.

• Replicating single agent portfolio weights:

  More taste for asset a may reflect
  – more taste for a by a participants (or more savings by these agents)
  – higher income share of a participants.
  – higher insider share of asset a
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Empirical Strategy

- 3 year trading periods, centered around SCF years 1995, 98, 2001, 04.

- 3 assets: stocks, housing, bonds (net nominal)

- Definition of household types
  - everybody holds bonds; 4 types by H, S participation: HS, H0, S0, 00
  - also divide into age groups: <35, 36-50, 51-65, >65

- Measurement
  - \((\alpha^i, E^i)\) directly from SCF, \(\bar{\theta}_a\) from Flow of Funds
  - \((s^i, \bar{\theta}^i)\) constructed by combining successive SCFs
    - use previous SCF, type transition matrix to build endowments
    - value endowment to find initial wealth, savings rate
Household Net Worth and Portfolio Weights

Net Worth/GDP

1990 1995 2000
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Changes in Distributions: Income \((E^i)\)

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- both stock ownership and home ownership increase (in \(E\) terms!)
- strong move \(H0 \rightarrow HS\)
- decline in total \(E\) (bond payoffs!)
Changes in Distributions: Asset Endowments \( (\tilde{\theta}_i^a) \)

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- higher insider share for stocks,
- stock insider share jumped (with market) in 1998
- housing moved \( H_0 \Rightarrow HS \)
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Changes in Investment Behavior

- **Savings Rate**

<table>
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<th>Year</th>
<th>Single Agent</th>
<th>HS &lt;35</th>
<th>HS 50-65</th>
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<td>1995</td>
<td>63</td>
<td>42</td>
<td>70</td>
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<td>1998</td>
<td>65</td>
<td>58</td>
<td>73</td>
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<td>2001</td>
<td>64</td>
<td>49</td>
<td>74</td>
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<td>2004</td>
<td>64</td>
<td>33</td>
<td>75</td>
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- increasing in age
- $00 < S0 < H0 < HS$ in a given year, and across years
- most types share jump in rate in 1998, young drop off later, old don't

- **Portfolio Weights**

  - two patterns from single agent: drop in bond weight, hump in stock weight
  - $HS$ shows muted versions of both patterns
  - $H0$ strongly substitutes from bonds to housing
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Freeze Investment Behavior at 1995 numbers

Net Worth/GDP

Stocks

Housing

Bonds
Freeze Participation Patterns at 1995 Numbers

Net Worth/GDP

1990 1995 2000

2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4

Housing

Stocks

Bonds

2000
Conclusion

• Framework distinguishes investment behavior, participation patterns

• What changed during boom-bust episodes?

  1. Investment behavior (conditional on participation)
     – Temporary (1998) taste for stocks, tracked by jump in savings rate
     – New millenium: move away from stocks (old!) and bonds (young!), lower savings rate (young!)

  2. Participation patterns
     – Gradual shift to integration, higher savings rates

• Both help shape stock, house booms.

• Framework.
  – simple check on role of disaggregated agents, assets.
  – tight link to micro data in trading periods considered.