Dissecting Saving Dynamics
Measuring Credit, Wealth, and Precautionary Effects

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US personal saving rate ($s$), 1966–2009
Literature

- **“Wealth Effects”**
  - Modigliani, Klein, MPS model, ...
  - \( s_t = -0.05m_t + \text{other stuff} \)

- **“Precautionary”**
  - Carroll (1992)
    - Saving rate rises in recessions
    - \( \Delta \log C_{t+1} \) strongly related to \( \mathbb{E}_t[u_{t+1} - u_t] \)

- **“Credit Availability”**
  - Secular Trend:
    - Parker (2000), Dynan and Kohn (2007), Muellbauer (many papers)
  - Cyclical Dynamics:
Great Recession:

- $s$ rises by 4 ~ 5 pp
- More than any previous postwar recession
- But all three indicators also move a lot:
  - Credit conditions tighten
  - Unemployment Expectations rise
  - Wealth falls
Household wealth 2007–2009 ↓ by 150% of income
Higher unemployment risk

University of Michigan $E_t[u_{t+4} - u_t]
Tighter (Muellbauer-CCI) HH Credit Supply
Our Contributions

▶ Theory
  ▶ Simple model that provides transparent role for all 3 channels
  ▶ Qualitative implications of the model
    ▶ “Overshooting” ⇒ possible role for fiscal policy
▶ Evidence
  ▶ Quantify importance of the 3 channels
  ▶ Two estimated models of $s$
    ▶ Reduced-form—OLS
    ▶ Structural—Minimum distance estimation
Theory à la Carroll and Toche (2009)

- CRRA utility, labor supply $\ell$, agg wage $W$, emp status $\xi$:
  \[
  v(m_t) = \max_{c_t} u(c_t) + \beta E_t[v(m_{t+1})]
  \]
  s.t.
  \[
  m_{t+1} = (m_t - c_t)R + \ell_{t+1}W_{t+1}\xi_{t+1}
  \]

- $\xi_{t+1} \in \{\xi^u, \xi^e\}$ where $\xi^u < \xi^e$
  - CT model: $\{\xi^u, \xi^e\} = \{0, 1\}$
  - Our model: wage-tax-financed unemp ins system so $\xi^u > 0$

- Tractability: unemployment shocks are permanent
  - If $\xi_t = \xi^u$ then $\xi_{t+1} = \xi^u$

- Target wealth $\check{m}$ exists and is stable:
  - Consumption chosen so that $m_t \to \check{m}$
Consumption function

\[ c = \text{Perf Foresight } \bar{c}(m) \]

\[ c(m) \]

Target \( m \)

Perm Inc
Target wealth $\hat{m}$

Closed-form solution for target wealth depends on unemployment risk $\overline{\Omega}$ and generosity of unemployment insurance $\xi^u$:

$$\hat{m} = f(\overline{\Omega}, \xi^u, \text{preferences}, \ldots)$$

Why does target wealth decline in $\xi^u$?

- $\xi^u \uparrow$ relaxes ‘Natural Borrowing Constraint’ (NBC)
- NBC: ‘never end with $a_t$ so low that $c_{t+1} = 0$ is possible’
- PDV of unemployment benefits is $\xi^u / (R - 1)$
- So NBC says $a_t > -\xi^u / (R - 1)$

We could add a tighter, ‘artificial’ borrowing constraint

- But tightening natural borrowing constraint is just like tightening artificial one
- Adds complexity to the model without adding insight

$\Rightarrow$ we assume our measure of credit conditions identifies NBC
Credit easing/Financial innovation & deregulation

$m$ is close to linear in $CCI$
Target wealth $\hat{m}$ as function of U risk $\mathcal{U}$
Saving Rate After a Permanent Rise in $\bar{U}$
Overshooting and Fiscal Policy

DSGE models:

- Frictions, frictions everywhere; but missing here
- If $c$ imposes ‘external’ costs of adjustment
  - Sticky prices/wages
  - Capital adjustment costs
  - Other reasons for ‘pecuniary externalities’
- ⇒ ‘stimulus’ payments may reduce cost of cycle
- Justification for ‘automatic stabilizers’?
Consumption After a Wealth Shock

The graph illustrates the relationship between consumption ($c$) and wealth ($m$) post a wealth shock. The curve $c(m)$ represents the consumption function. The points $c_t$ and $c_{t+1}$ denote consumption levels at time $t$ and $t+1$ respectively. The figure shows how consumption adjusts over time following a wealth shock, moving from $m_t$ to $\tilde{m}$, with $\tilde{c}$ indicating a sustainable consumption level.
Data & sources

- Quarterly 1966Q2–2009Q3
- PSR: BEA NIPA
- Net worth: Flow of Funds, Fed
- $m$: Net worth–disposable income ratio
- $CCI$: Senior Loan Officer Survey (SLOOS), Fed
  Question on banks’ willingness to provide consumer installment loans
- Uncertainty: using Michigan unemployment expectations
Net worth (fraction of quart disp income)
Credit Conditions Index (CCI) à la Muellbauer

Normalized accumulated responses to:

“Please indicate your bank’s willingness to make consumer installment loans now as opposed to three months ago.”
\( U_t \) implied by Michigan U expectations

- Regress: \( \Delta_4 u_{t+4} = \alpha_0 + \alpha_1 UExp_t \)
- U risk: \( U_t = u_t + \Delta_4 \hat{u}_{t+4} \)
- \( \Delta_4 u_{t+4} \equiv u_{t+4} - u_t, \quad \Delta_4 \hat{u}_{t+4} \equiv \text{fitted values} \)
- \( U_t \) tracks but precedes actual U
Reduced-form regressions

OLS/IV: \[ s_t = \gamma_0 + \gamma_m m_t + \gamma_{CCI} CCl_t + \gamma_{\delta} \delta_t + \gamma' X_t + \varepsilon_t^s \]

<table>
<thead>
<tr>
<th>Param</th>
<th>Baseline</th>
<th>Uncert</th>
<th>Lag ( s_{t-1} )</th>
<th>Full</th>
<th>Post-80</th>
<th>IV</th>
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<tbody>
<tr>
<td>( \gamma_0 )</td>
<td>16.72***</td>
<td>16.74***</td>
<td>6.73***</td>
<td>17.74***</td>
<td>18.57***</td>
<td>17.28***</td>
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<tr>
<td></td>
<td>(1.52)</td>
<td>(1.54)</td>
<td>(1.43)</td>
<td>(1.74)</td>
<td>(1.59)</td>
<td>(1.53)</td>
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<tr>
<td>( \gamma_m )</td>
<td>−1.74***</td>
<td>−1.76***</td>
<td>−0.63***</td>
<td>−1.79***</td>
<td>−1.48***</td>
<td>−1.82***</td>
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<tr>
<td></td>
<td>(0.29)</td>
<td>(0.32)</td>
<td>(0.20)</td>
<td>(0.29)</td>
<td>(0.26)</td>
<td>(0.29)</td>
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<tr>
<td>( \gamma_{CCI} )</td>
<td>−5.35***</td>
<td>−5.28***</td>
<td>−2.58***</td>
<td>−5.47***</td>
<td>−7.68***</td>
<td>−5.32***</td>
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<tr>
<td></td>
<td>(0.55)</td>
<td>(0.63)</td>
<td>(0.51)</td>
<td>(0.60)</td>
<td>(0.80)</td>
<td>(0.51)</td>
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<tr>
<td>( \gamma_{\delta} )</td>
<td>0.27***</td>
<td>0.26***</td>
<td>0.14**</td>
<td>0.16*</td>
<td>0.05</td>
<td>0.25***</td>
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<tr>
<td></td>
<td>(0.07)</td>
<td>(0.10)</td>
<td>(0.05)</td>
<td>(0.09)</td>
<td>(0.11)</td>
<td>(0.08)</td>
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<td>( \gamma_{s} )</td>
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<td>(0.48)</td>
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<tr>
<td>( \bar{R}^2 )</td>
<td>0.91</td>
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<td>DW stat</td>
<td>1.00</td>
<td>0.99</td>
<td>2.22</td>
<td>1.04</td>
<td>1.16</td>
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Other var's in \( X \) play small role.
PSR fit in full sample & post-1980

NIPA Saving Rate Fitted − Full Sample
Fitted − Post−1980
Reduced-form regressions—Summary

- Three significant drivers: $m$, $CCI$, $\mathcal{U}$
- Explain $>90$ percent of variation in $s$
- Good fit (full sample and post-1980)
- Other vars don't increase expl power
demographics, corp&gov saving, int rate (to some extent)
- Great Recession 07–09

\[
\begin{align*}
g_m \times \Delta m &= -1.7 \times -1.8 = 3.1 \\
g_{CCI} \times \Delta CCI &= -5.4 \times -0.077 = 0.4 \\
g_{\mathcal{U}} \times \Delta \mathcal{U} &= 0.3 \times 4.8 = 1.4
\end{align*}
\]

Explained $\Delta s = 4.9$
Actual $\Delta s = 4.0$
Structural estimation

- Assume $\bar{m}_t = \gamma_0 + \gamma_1 CCI_t$
- ie rescale CCI to get wealth units right
- Calculate $\hat{m}_t = f(\mathcal{U}_t, \bar{m}_t, R, G, \ldots)$
- Calculate PSR $\hat{s}_t$ implied by model
- Estimate $(\beta, \gamma_0, \gamma_1)$ by

$$\min \sum (s_t - \hat{s}_t)^2$$
Calibration (for model with $\bar{m}_t \equiv 0$)

<table>
<thead>
<tr>
<th>Description</th>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>CRRA</td>
<td>$\rho$</td>
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<tr>
<td>Interest rate factor</td>
<td>$R$</td>
<td>1.003</td>
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<tr>
<td>Income growth factor</td>
<td>$G$</td>
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<tr>
<td>Discount factor</td>
<td>$\beta$</td>
<td>0.98</td>
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<td>implied by matching mean $m = 19.7$</td>
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Target Wealth $\hat{m}_t$
Conclusion

- All three effects seem to be present
- Easier borrowing largely explains secular decline
- Order of importance in Great Recession:
  1. Wealth shock
  2. Labor income risk
  3. Credit tightening
  4. Deleveraging/elevated saving rate likely to continue for a while


