Discussion of Berger and Vavra (2012): Consumption Dynamics During Recessions

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Macro Reading Group

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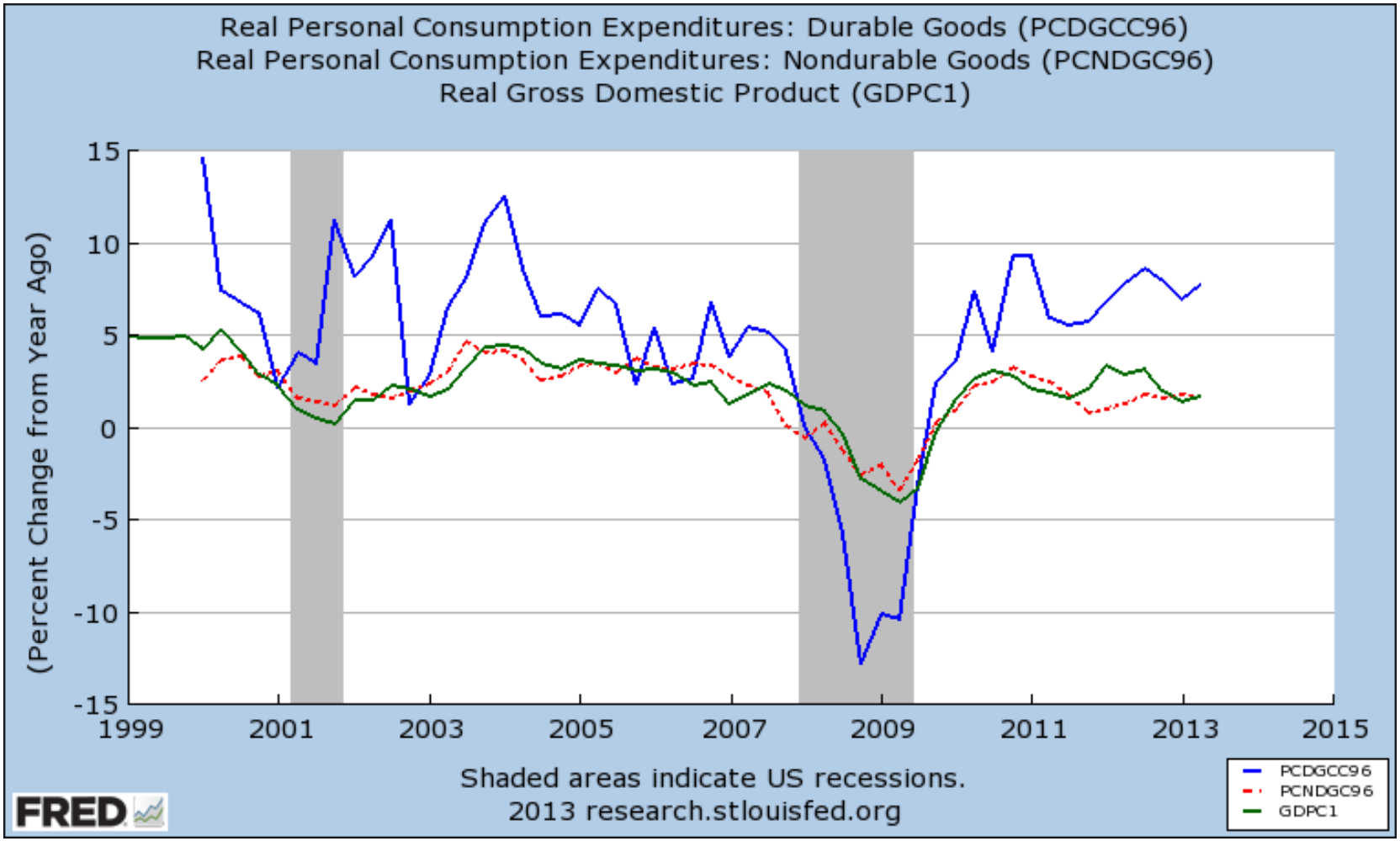
Motivation

Last week: Kaplan and Violante's life cycle model showing the importance of adjustment costs in saving decisions

- wealthy hand-to-mouth consumers
- Economic climate affects the reaction to tax rebate

$\Rightarrow$ let's model the business cycle explicitly

Motivation


Real Personal Consumption Expenditures: Durable Goods (PCDGCC96)
Real Personal Consumption Expenditures: Nondurable Goods (PCNDGC96)
Real Gross Domestic Product (GDPC1)
(Percent Change from Year Ago)
15
10
5
0
-5
-10
-15
1999
2001
2003
2005
2007
2009
2011
2013
2015
Shaded areas indicate US recessions.
2013 research.stlouisfed.org
FRED
PCDGCC96
PCNDGC96
GDPC1

Contribution

- heterogeneous agents DSGE model with imperfect credit markets
- non-linearity
  - doubling of a program can more than double results, if people are pushed to the adjusting region
  - interaction of adjustment costs in durable consumption and business cycle
    $\Rightarrow$ effectiveness of policies depends on the business cycle
- additional empirical evidence supporting the model

Model

- Households
  - Problem

$$\max_{\{c_t^i, d_t^i, a_t^i\}_{t=0}^{\infty}} \mathrm{E} \sum_{t=0}^{\infty} \beta^t \frac{\left[\left(c_t^i\right)^{\nu} \left(d_t^i\right)^{1-\nu} \right]^{1-\theta} - 1}{1-\theta}$$

$$c_t^i = w_t h \eta_t^i + (1 + r_t) a_t^i - a_t^i + d_{t-1}^i (1 - \delta_d) - d_t^i - F(d_t^i, d_{t-1}^i)$$

$$a_t^i \geq 0, d_t^i \geq 0$$

$$F(d_t^i, d_{t-1}^i) = \begin{cases} 0 & \text{if } d_t^i \in \left((1-\delta_d) d_{t-1}^i, d_{t-1}^i\right) \\ f(1-\delta_d) d_{t-1}^i & \text{otherwise.} \end{cases}$$

  - Value functions
    $V^{adjust}(a_{-1}^i; d_{-1}^i; \eta^i; Z; K)$, $V^{noadjust}(a_{-1}^i; d_{-1}^i; \eta^i; Z; K)$ and $V = \max(V^{adjust}, V^{noadjust})$

Model

- Firms

$$w_t = (1-\alpha) Z_t K_t^{\alpha} H^{-\alpha}$$
$$r_t = \alpha Z_t K_t{}^{\alpha} - 1 H^{1-\alpha} - \delta_K$$

- Shocks
  - idiosyncratic household productivity

$$\log \eta_t^i = \rho_\eta \log \eta_{t-1}^i + \varepsilon_t^i$$

  - aggregate productivity

$$\log Z_t = \rho_Z \log Z_{t-1} + \xi_t$$

- Market clearing

$$C_t + D_t + F_t = Z_t K_t^{\alpha} H^{1-\alpha} + (1-\delta_K) K_t + (1-\delta_d) D_{t-1}$$

where $C_t = \int c_t^i$, $D_t = \int d_t^i$, $K_t = \int a_{t-1}^i$, $F_t = \int F(d_t^i, d_{t-1}^i)$ and $H = \int h \eta_t^i$

Model

Solution

Krusell-Smith algorithm:

1. Guess aggregate law of motion for K: $K_{t+1} = \gamma_0(Z) + \gamma_1(Z)K_t$
2.
   - given γ's, household can forecast prices independently of their own actions
   - use VFI to solve for the optimal choices for c^i, d^i and a^i
3. simulate the model and update γ's

Results

Durable gap: $z_{i,t} = d^*_{i,t} - d_{i,t-1}$

Aggregate durable expenditures $X_t = \int z_{i,t} h_t(z_{i,t}) f(z_{i,t})$

where

- $h_t(z_{i,t}) = \mathrm{P}(adjust|z_{i,t})$ hazard function
- $f(z_{i,t})$ density

Big aggregate adjustment if either

- bigger adjustments $\rightarrow$intensive margin:
- more households want to adjust$\rightarrow$extensive margin

The two margins are affected differently by economic conditions

Calibration: Recession=negative Z shock+fall in capital stock

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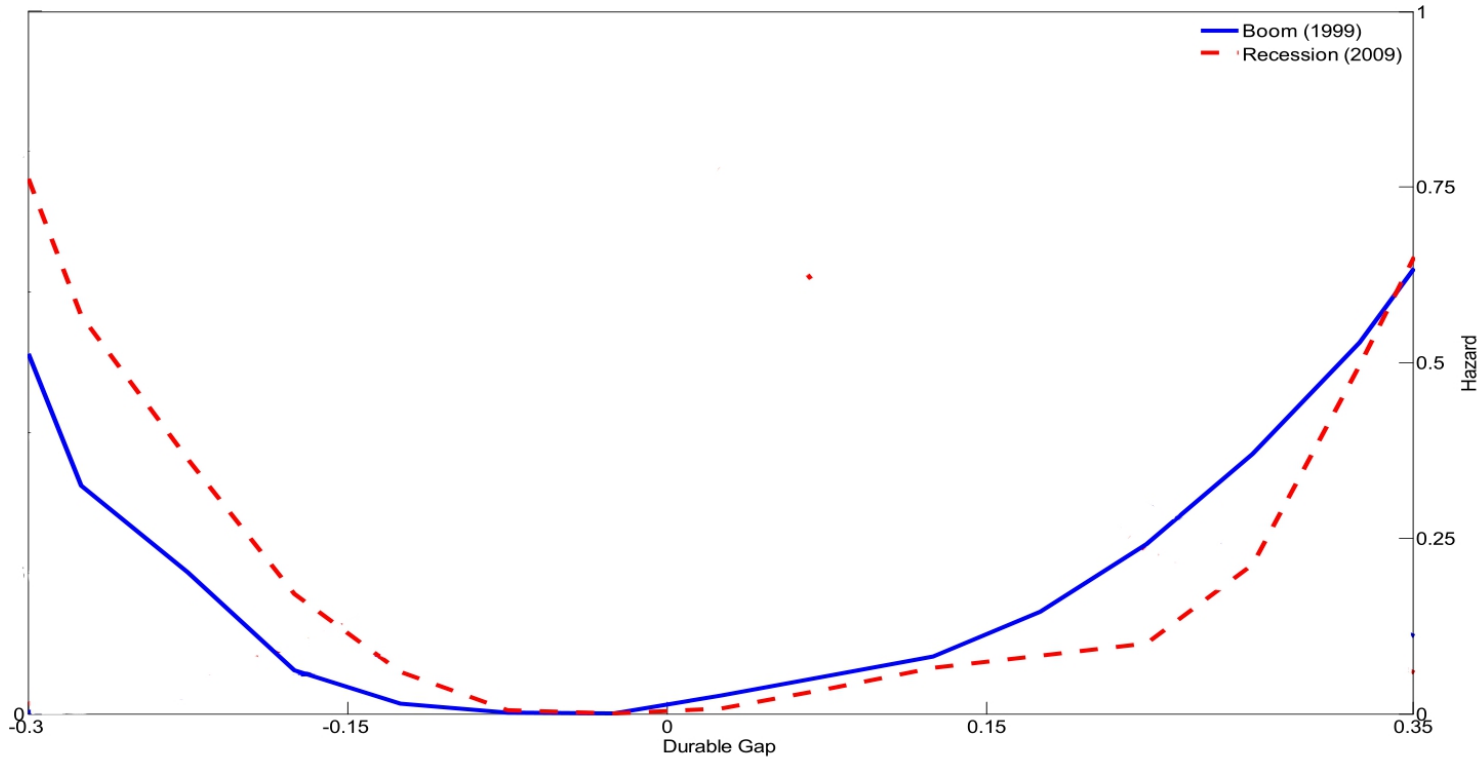

Figure : hazard function

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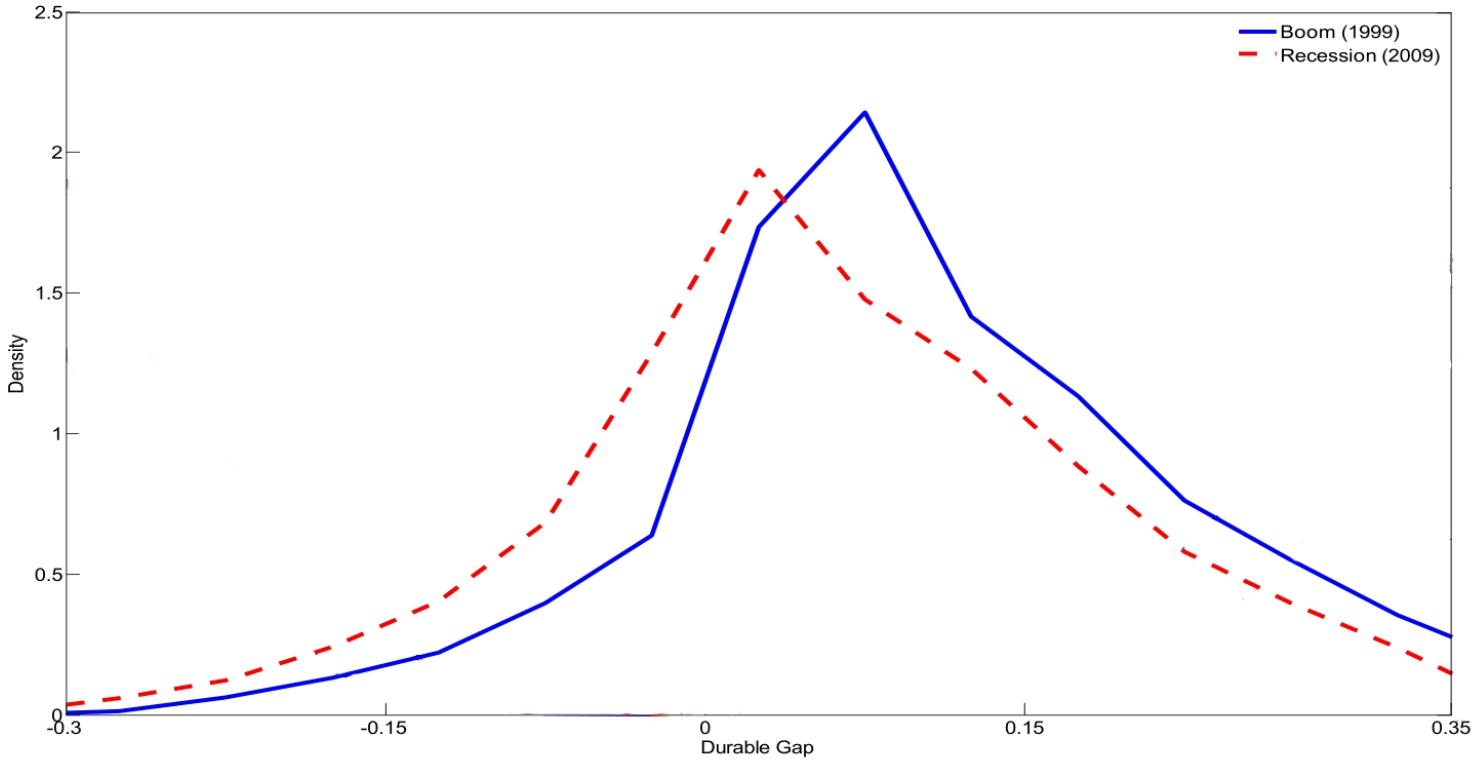
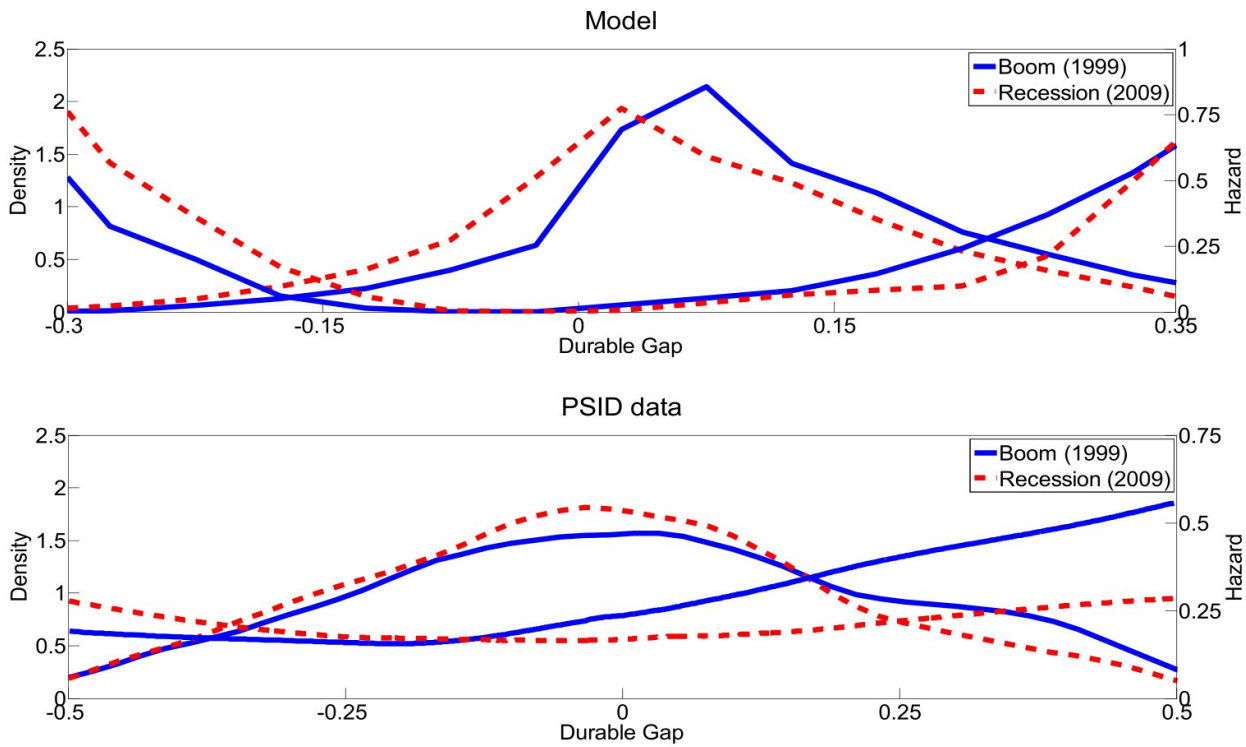


Figure : density

Additional evidence: Micro

Desired durable stock $d^*_{i,t}$ not directly observed in the data

1. simulate the model and build series which are observable in reality (c^i, a^i, d^i)
2. use the model $d^*_{i,t}$ to estimate ω in $d^*_{i,t} = g_\omega(c^i, a^i, d^i)$
3. reconstruct $\hat{d}^*_{i,t} = g_\omega(c^i, a^i, d^i)$ using the real data



Additional evidence:Time series

Prediction of the model: response of durable expenditures to aggregate shocks weaker in recessions

1. Estimate AR process of durable expenditures (1960-2010)

$$X_t = \sum_{j=1}^{p} \phi_j X_{t-j} + e_t$$

   The hypothesis is that e_t is heteroskedastic: $e_t = \delta_t \xi_t$ and $\delta_t = \alpha + \eta \bar{X}_{t-1}$ where $\bar{X}_{t-1} = \frac{1}{k} \sum_{j=1}^{k} X_{t-j}$, and $\xi_t \approx \mathrm{N}(0, 1)$

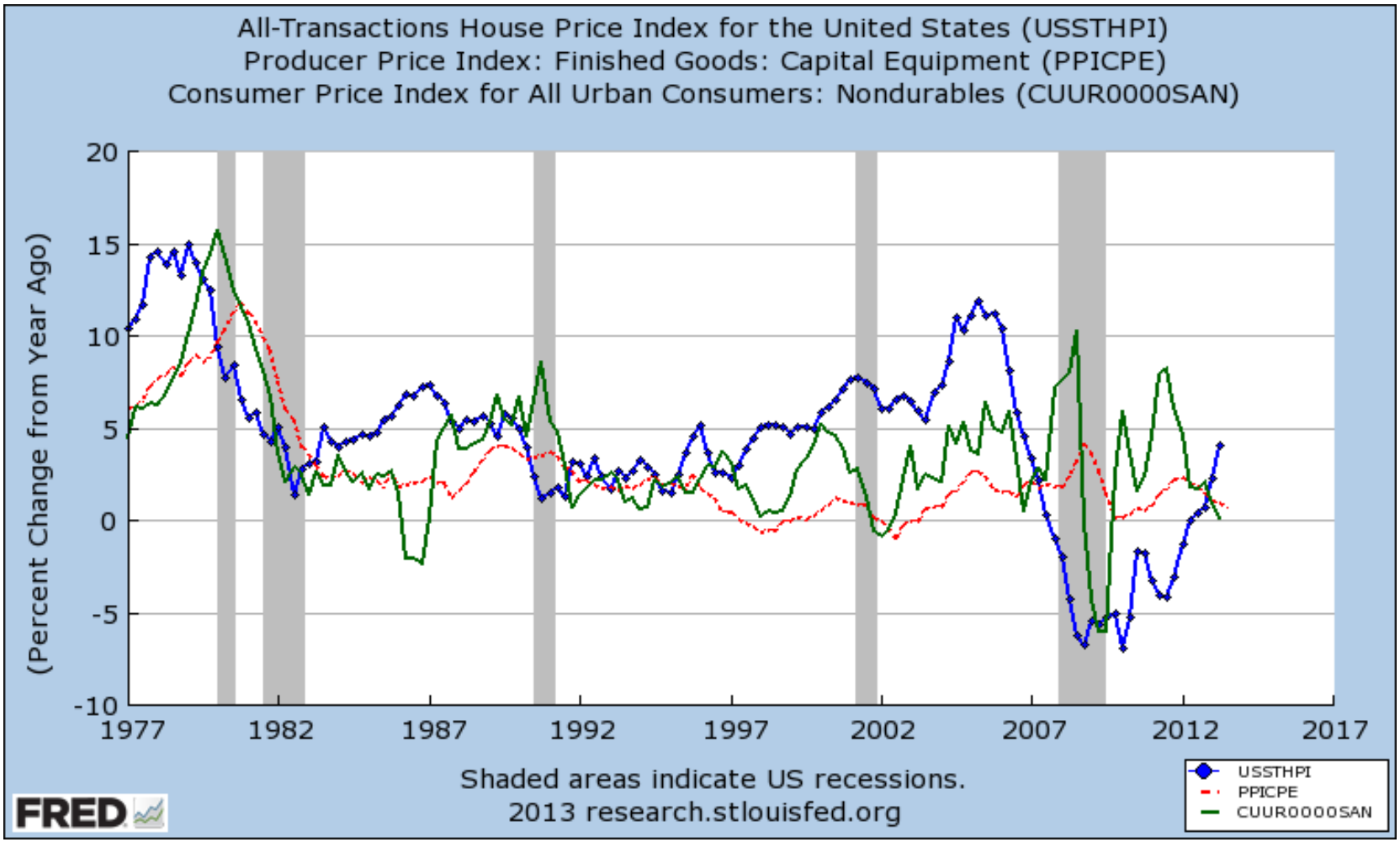
2. use estimated residuals to get $\hat{\eta}$

$$|e_t| = \left(\frac{2}{\pi}\right)^2 (\alpha + \eta \bar{X}_{t-1}) + \varepsilon_t$$

$\hat{\eta} > 0 \Rightarrow$ evidence for stronger response in booms

Discussion

MRS capital/durable/non-durable consumption good fixed:
$c_t^i + a_t^i + d_t^i = income - F(d_t^i, d_{t-1}^i)$



Discussion

Some durable goods have features saving assets

- house provides store of value, car not so much
- car only depreciates, house can be expanded to increase its value

The model is stationary, so the adjustment costs fit houses, but not cars/appliances

Berger and Vavra use only 2.5% adjustment costs.

Discussion

Saleem: not all durables as volatile