Confidence Cycles

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The **Great Financial Crisis** (2008-2009) renewed focus on

- Credit booms $\leftrightarrow$ Recessions
- Beliefs, confidence, perceptions $\leftrightarrow$ State of the economy

The GFC and the Housing/Credit Boom-Bust

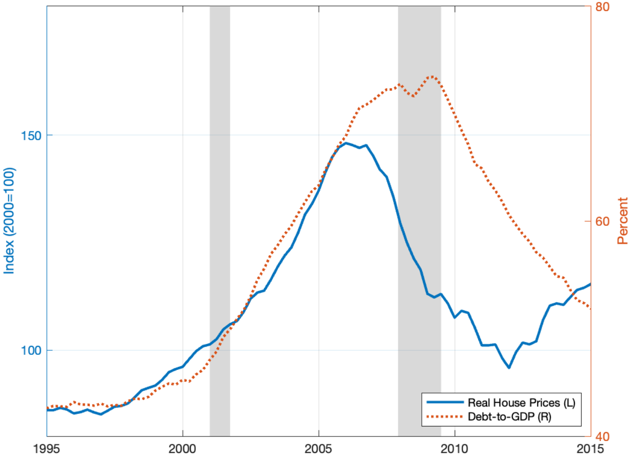

Figure 1: House Prices: S&P/Case-Shiller National Price Index; Debt-to-GDP: mortgages/NGDP

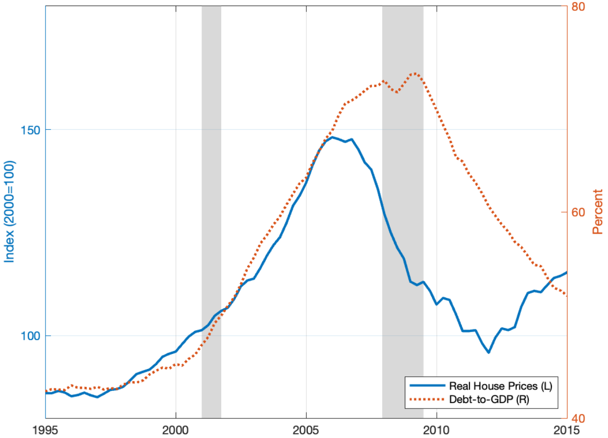

Figure 1: House Prices: S&P/Case-Shiller National Price Index; Debt-to-GDP: mortgages/NGDP

*What is the role of **confidence** in credit-driven booms & busts?*

Existing Narratives: Fundamentals

Fundamental-based theories:

1. **Monetary policy & Great Moderation**: prolonged period of low rates → housing more attractive → favorable credit conditions (Taylor, 2007)

2. **Credit liberalization**: $\downarrow$ credit standards → $\uparrow$ credit supply → $\uparrow$ borrowing against constant collateral value (Mian & Sufi, 2009)

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1. **Monetary policy & Great Moderation**: prolonged period of low rates → housing more attractive → favorable credit conditions (Taylor, 2007)
   - Models w/ low rates fail to explain boom-bust in debt/house prices

2. **Credit liberalization**: ↓ credit standards → ↑ credit supply → ↑ borrowing against constant collateral value (Mian & Sufi, 2009)
   - Models w/ credit liberalization fail to explain boom-bust in debt/house prices

     ⟶ resort to exogenous (counterfactual) preference shocks

Existing Narratives: Non-Fundamental

Evidence points toward less "rational" stories...

- Case & Shiller (2003): home-buyers expected house prices ↑ up to 15%/year in 2003
- Piazzesi & Schneider (2009): # people expecting house prices ↑ doubled 2006-07

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... motivating theories detached from fundamentals:

3. **Beliefs & expectations**: fluctuations in expectations $\perp$ economic outlook
    - Models w/ deviations from FIRE (bubbles, non-rational $\mathbb{E}$, info frictions, ...)

This Paper

This paper provides a **quantitative assessment** of the role of confidence

- *Confidence* is defined as shifts in $\mathbb{E}$ unrelated to **economic fundamentals**
  - Originates in documented psychological evidence of overconfidence
  - Has macro effects propagating through *higher order beliefs*

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- *Confidence* is defined as shifts in $\mathbb{E}$ unrelated to **economic fundamentals**
  - Originates in documented psychological evidence of overconfidence
  - Has macro effects propagating through *higher order beliefs*

- Supporting evidence is constructed in two steps:
  1. Through a **model** with

     household heterogeneity + financial frictions + innovations to Confidence
  2. In a **SVAR**, identifying Confidence shocks in the micro-data (Michigan SoC)

Preview of findings

- **Model**: Confidence accounts for a significant measure of house-price volatility + can explain *quantitatively* the credit/housing boom

\+ Model-implied Confidence series has strong positive correlation (0.74) with empirical proxy used in SVAR

- **SVAR**: *identified* Confidence has significant effects on house prices + shocks to confidence explain portion of forecast error variance for 5+ years

Connection with the Literature

- **Financial frictions & house prices**: Liu, Wang Zha (ECMA, 2013), Justiniano et al. (RED, 2015), Guerrieri & Iacoviello (JME, 2017)
  - **Contribution**: Role of belief shocks in explaining house-price volatility
- **Non-fundamental-driven economic activity**: Lorenzoni (AER, 2009), Barski & Sims (AER, 2012), Angeletos, Collard & Dellas (ECMA, 2018), Acharya et al. (JET, 2021)
  - **Contribution**: Interaction of informational and financial frictions
- **Expectations & credit boom**: Bordalo et al. (JoF, 2017), Berger et al. (RES, 2018), Kaplan et al. (JPE, 2020), Martin, Ventura (AER, 2018), Chodorow-Reich et al. (2024)
  - **Contribution**: Tractable framework to assess importance of beliefs fluctuations

This Talk

- **"Toy" model** to fix ideas and conceptualize *animal spirits*
- **Full model** to *quantify* the role of confidence in GFC
- **Empirical exercise**: *identification* of confidence in the microdata (SVAR)

Model

A Baseline Model

Small-scale RBC model with housing and three main features:

- **Households' heterogeneity**: savers and borrowers
- **Financial frictions**: borrower subject to collateral constraint
- **Confidence shocks**: shifts in agents' beliefs about current economic activity generating waves of optimism/pessimism ($\mathbb{E} \perp$ fundamentals)

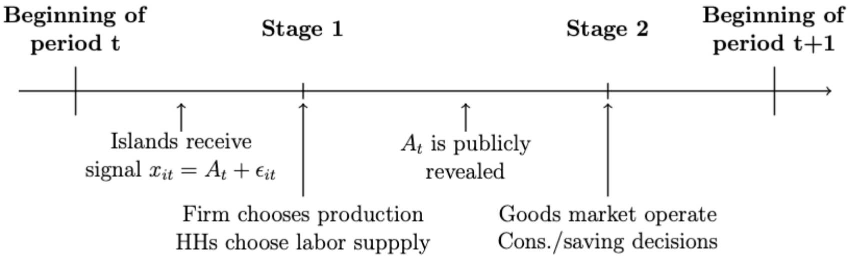
Economic Environment

- Time is discrete, each period has **2 stages**
- Continuum of *islands*, each w/ representative **firm** and 2 heterog. **HHs**
- HHs consume final non-durable (**CES** aggregate), durable; save, work, invest
- Each island produces a differentiated local **non-durable** good and is endowed with a **durable** good in fixed supply
- Firm in island i demands K and L from HHs to produce local good with **exogenous aggregate technology**:

$$y_{it} = A_t k_{i,t-1}^{\alpha} n_{it}^{1-\alpha}$$

- A_t is **imperfectly observed**: each island observes idiosyncratic noisy signal

Builds on Angeletos et al. (2018): each period divided in 2 stages:



- **Stage 1**: A_t is not perfectly observed. Each island receives signal

$$x_{it} = A_t + \epsilon_{it}, \quad \epsilon_{it} \sim (0, \sigma^2)$$

- **Stage 2**: A_t revealed: good markets operate, consumption/saving decisions

CONCEPTUALIZING THE *ANIMAL SPIRITS* (I)

$$x_{it} = A_t + \epsilon_{it}, \quad \epsilon_{it} \sim (0, \sigma^2)$$

Depart from **common-prior** assumption: $\mathbb{E}_{it}[\epsilon_{it}] = \mathbb{E}_{it}[\epsilon_{jt}] = 0 \quad \forall\, i, j$

$$x_{it} = A_t + \epsilon_{it}, \quad \epsilon_{it} \sim (0, \sigma^2)$$

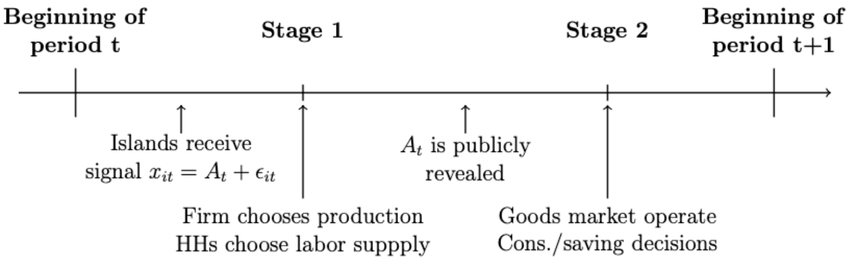
Depart from **common-prior** assumption: $\mathbb{E}_{it}[\epsilon_{it}] = \mathbb{E}_{it}[\epsilon_{jt}] = 0 \quad \forall\, i, j$

- Relax the assumption:

$$\mathbb{E}_{it}[\epsilon_{jt}] = \begin{cases} 0 & \text{for } i = j \\ \Gamma_t & \text{for } i \neq j \end{cases} \qquad \Gamma_t = \phi\Gamma_{t-1} + \varepsilon_t$$

- Each island expects to have an **unbiased** signal, but expects others' to be subject to **exogenous state** of the world Γ_t
- Γ_t represents our notion of *optimism/pessimism*: the *animal spirits*

Assume $\Gamma_t > 0$:



Conceptualizing the *Animal Spirits* (II)

Assume $\Gamma_t > 0$:

- In Stage 1, firm expects demand:

$$\mathbb{E}_1\left[Y_t \,\middle|\, \underbrace{x_{it}}_{i\text{'s signal}}, \underbrace{\Gamma_t}_{\text{agg. belief}}\right] > \mathbb{E}_1\left[Y_t \,\middle|\, x_{it}, \Gamma_t = 0\right]$$

- Higher expected aggregate demand $\Longrightarrow \uparrow$ **production**
- $\uparrow$ demand for labor, capital $\Longrightarrow \uparrow$ **wages, returns**
- $\uparrow$ HH total income: $\uparrow$ **consumption** and, possibly, $\uparrow$ **hours**

Saver chooses durable (h_{it}) / non-durable (c_{it}) consumption, investment (i_{it}), debt (d_{it}), labor supply (n_{it}):

$$\max_{c_{it},h_{it},i_{it},d_{it},n_{it}} \mathbb{E}_t \left[\sum_{s=0}^{\infty} \beta^s \left(\log c_{i,t+s} + \psi \log h_{i,t+s} - \frac{n_{i,t+s}^{1+\nu}}{1+\nu} \right) \right]$$

s.t.

- $c_{it} + i_{it} + q_{it} h_{it} + R_{t-1} d_{i,t-1} = w_{it} n_{it} + r_{k,it} k_{i,t-1} + d_{it} + q_{it} h_{i,t-1} + s_{it}$
- $k_{it} = (1-\delta) k_{i,t-1} + i_{it}$

In equilibrium: $d_{it} \leq 0$ (saver is lending)

Borrower's Problem

Borrower has $\tilde{\beta} < \beta$: borrows from saver to finance current consumption

$$\max_{c_{it}, h_{it}, d_{it}, n_{it}} \mathbb{E}_t \left[\sum_{s=0}^{\infty} \tilde{\beta}^s \left(\log \tilde{c}_{i,t+s} + \psi \log \tilde{h}_{i,t+s} - \frac{\tilde{n}_{i,t+s}^{1+\nu}}{1+\nu} \right) \right]$$

s.t.

- $\tilde{c}_{it} + q_{it}\tilde{h}_{it} + R_{t-1}\tilde{d}_{i,t-1} = w_{it}\tilde{n}_{it} + \tilde{d}_{it} + q_{it}\tilde{h}_{i,t-1}$
- $\tilde{d}_{it} \leq M q_{it} \tilde{h}_{it}$

Borrowing is subject to **collateral**: can borrow up to a % of housing wealth

Firm's Problem

Local firm maximizes profits:

$$\max_{k_{it}^d, n_{it}^d} \quad p_{it} y_{it} - w_{it} n_{it}^d - r_{k,it} k_{it}^d$$

s.t.

$$y_{it} = A_t (k_{it}^d)^{\alpha} (n_{it}^d)^{1-\alpha}$$

$$y_{it} = \left(\frac{p_{it}}{P_t} \right)^{-1/\rho} \mathbb{E}_t \left[Y_t \mid \Omega_1 \right]$$

with Y_t being the aggregate demand for the local good from all islands

Consider the two FOCs defining optimal durable demand:

SAVER
$$\underbrace{\frac{q_{it}}{c_{it}}}_{\text{MC (durables)}} = \underbrace{\frac{1}{h_{it}} + \beta\,\mathbb{E}_t\left[\frac{q_{i,t+1}}{c_{i,t+1}} \,\middle|\, \Omega_2\right]}_{\text{MB (durables)}}$$

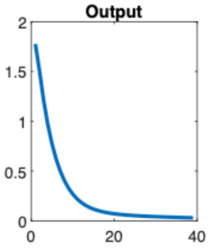
BORROWER
$$\frac{q_{it}}{\tilde{c}_{it}} = \frac{1}{\tilde{h}_{it}} + \tilde{\beta}\,\mathbb{E}_t\left[\frac{q_{i,t+1}}{\tilde{c}_{i,t+1}} \,\middle|\, \Omega_2\right] + \underbrace{M\mu_{it}q_{it}}_{\text{Borr. constraint}}$$

- Belief shocks (*optimism*) $\rightarrow$ $c_{it} \uparrow$ $\rightarrow$ $\downarrow$ MC (durables) given fixed q_{it}
- *Transitory* effect: $c_{i,t+1}, \tilde{c}_{i,t+1}$ rigid
- Housing demand $\uparrow$ + Fixed Supply $\rightarrow$ house prices $(q_{it}) \uparrow$

+ $q_{it} \uparrow$ $\rightarrow$ relaxation of collateral constraints $\rightarrow$ Amplification

$$\mathbb{E}\left[Y_t \;\middle|\; \Omega_1\right] \uparrow$$

Dynamics: IRFs for $\Gamma_t > 0$



Quarters

Figure 2: IRFs to 1-SD confidence shock. Units are % log-deviations from steady state

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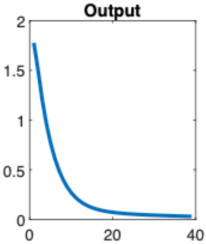

$N_t \uparrow$

Quarters

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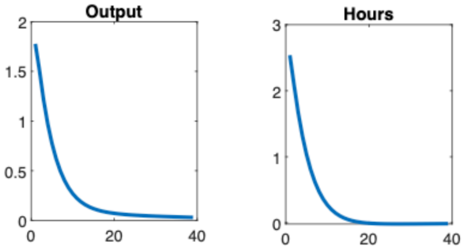

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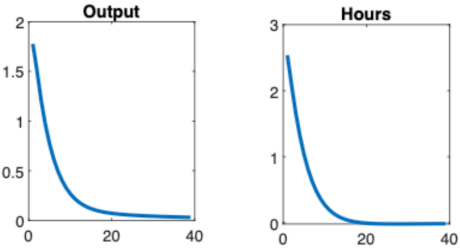

$W_t \uparrow$

Quarters

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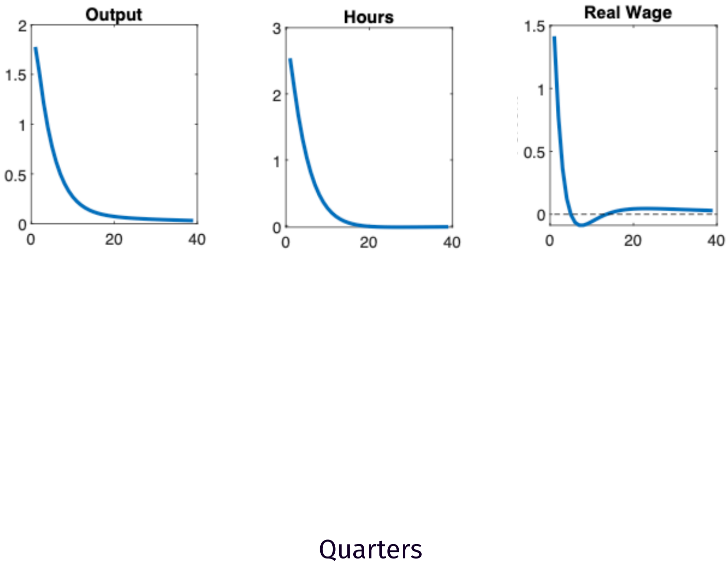

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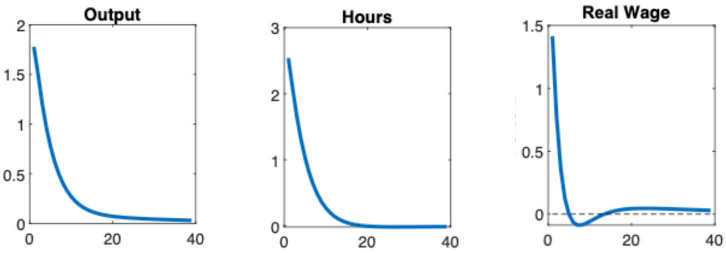

$I_t \uparrow$

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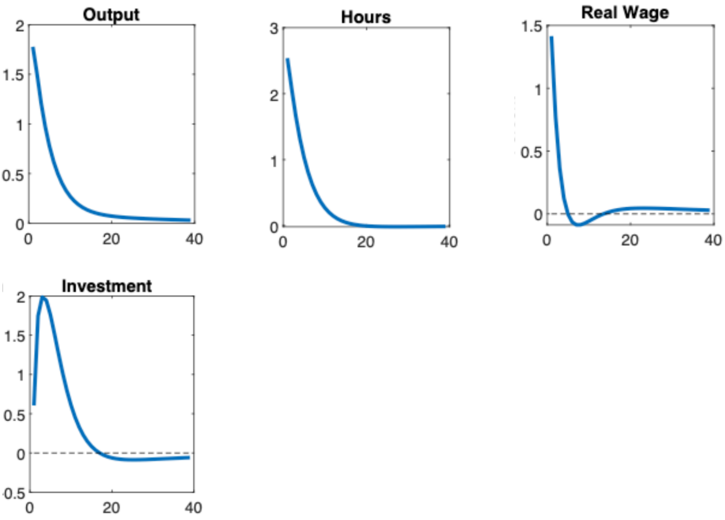

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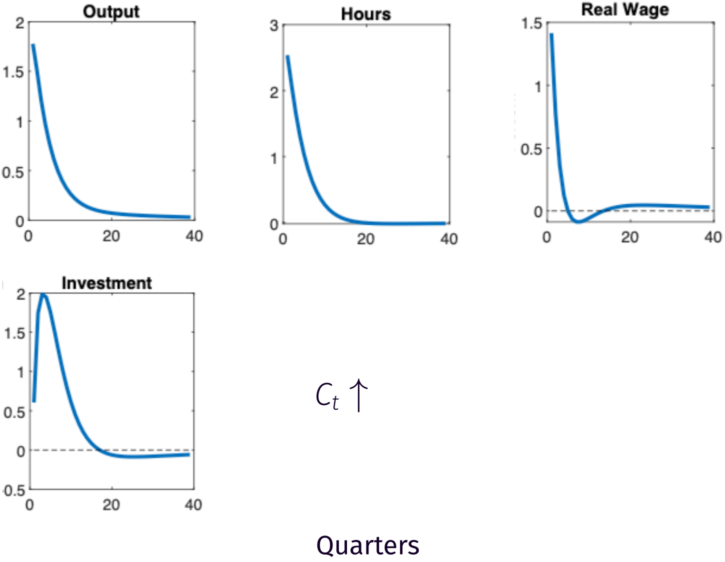

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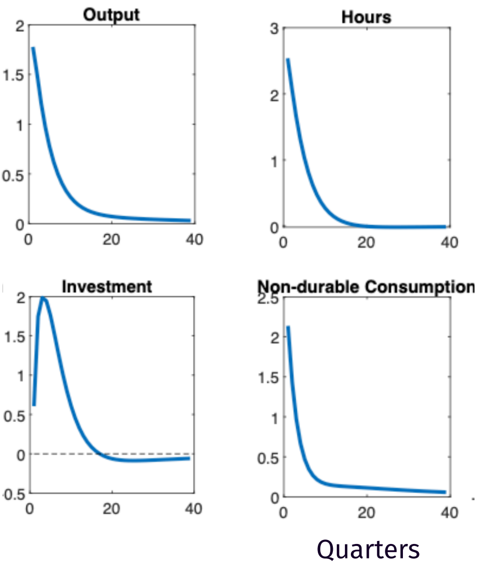

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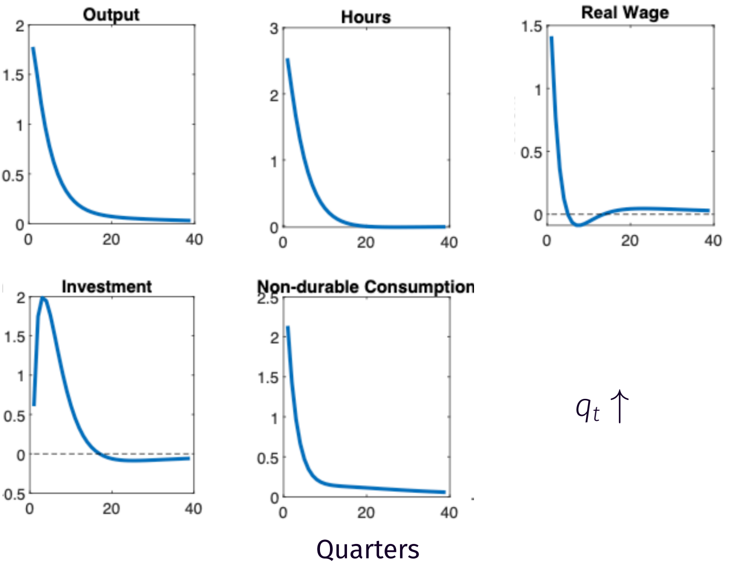

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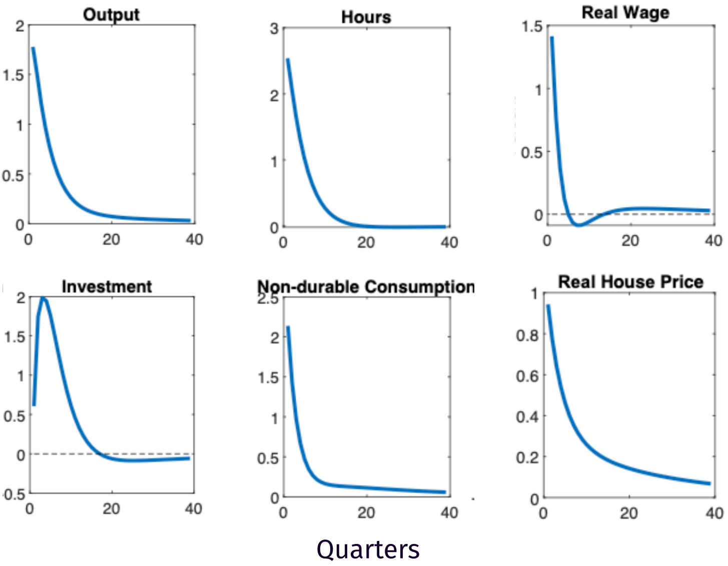

Figure 2: IRFs to 1-SD confidence shock. Units are % log-deviations from steady state

Goal: Quantitative Assessment of the role of Confidence

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We extend the model to include:

- **Real rigidities**: investment adjustment costs and consumption habits
- **Nominal rigidities**: monopolistic competition and sticky-prices
- Several shocks : intertemporal preferences, durable/non-durable elasticity, investment efficiency, monetary policy, leverage/collateral

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- **Nominal rigidities**: monopolistic competition and sticky-prices
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Estimation is based on 6 observables (1980-2017): non-durable consumption, real investment, hours, real house prices, CPI inflation, Federal Funds Rate

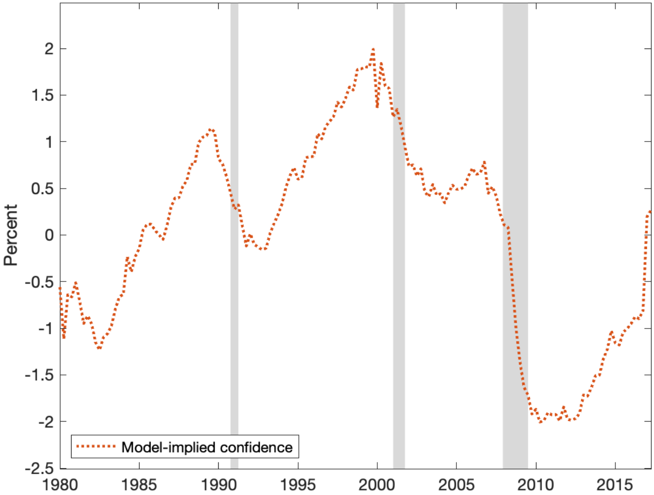


Figure 3: Confidence Series estimated by the Full Model (1980-2017)

Model's *Confidence* v. Empirical Proxy

University of Michigan's **Survey of Consumers**:

1. *Do you think that today is a good or a bad time to buy a major household item?*
2. *Do you think that your family is worse off financially with respect to one year ago?*
3. *Do you think that a year from now your family will be better off financially, or worse off, or just about the same as now?*
4. *Do you think that during the next twelve months business conditions in the country will experience good times financially, or bad times, or what?*
5. *Which would you say is more likely, that in the country as a whole we'll have continuous good times during the next five years or so, or that we will have periods of widespread unemployment or depression, or what?*

Model's *Confidence* v. Empirical Proxy

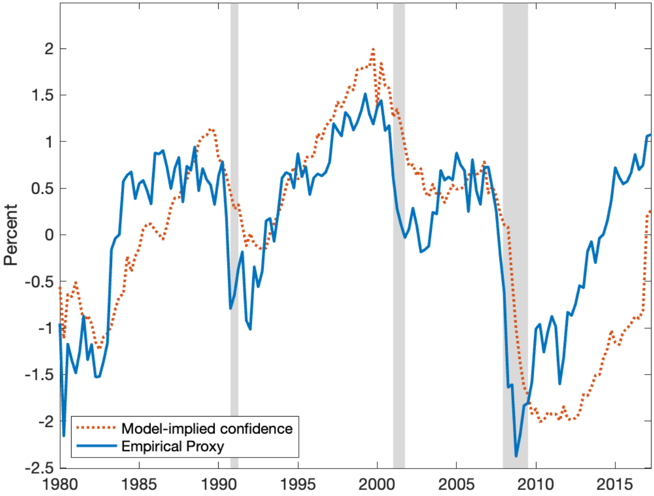


Figure 3: Model-implied *Confidence* v. Empirical Proxy (MSC)

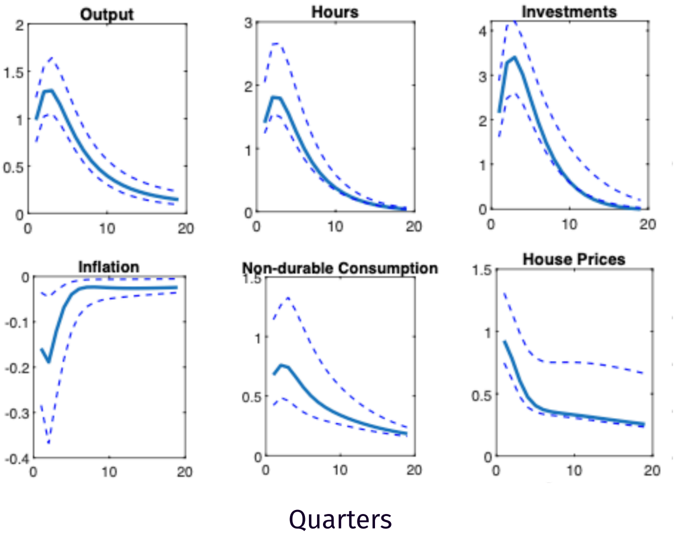


Figure 4: IRFs to 1-SD confidence shock. Units are % log-deviations from steady state.

What fraction of the VAR's forecast errors is due to each shock?

	Shocks						
Observable	Conf	Tech	HousPref.	Inv.	Demand	Monetary	Leverage
Cons.	42%	48%	1%	1.5%	3.5%	4%	0%
Inv.	29%	24%	0%	16%	14%	16%	1%
Hours	84%	1%	0%	6%	1%	8%	0%
House Prices	52%	20%	0%	3%	20%	4%	1%
Inflation	11%	26%	0%	3%	15%	44%	1%
FFR	36%	19%	0%	9%	4%	30%	0%

Figure 5: Forecast Error Variance Decomposition – Shock contrib. (columns) on observable (rows)

What's each shock's contribution to matching House Prices' observed path?

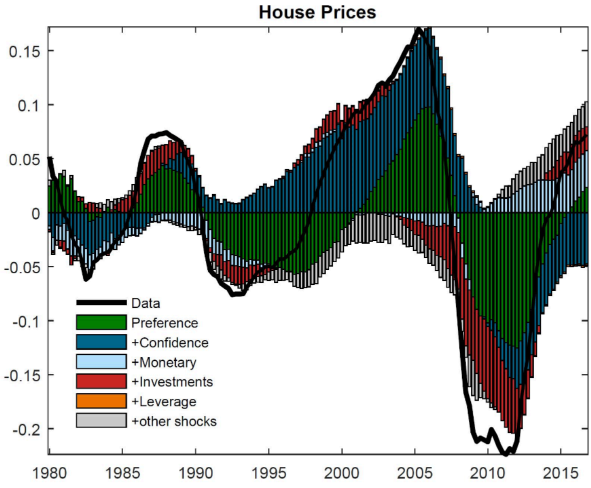


Figure 6: Historical Shock Decomposition for House Prices

Empirical Evidence

DATA

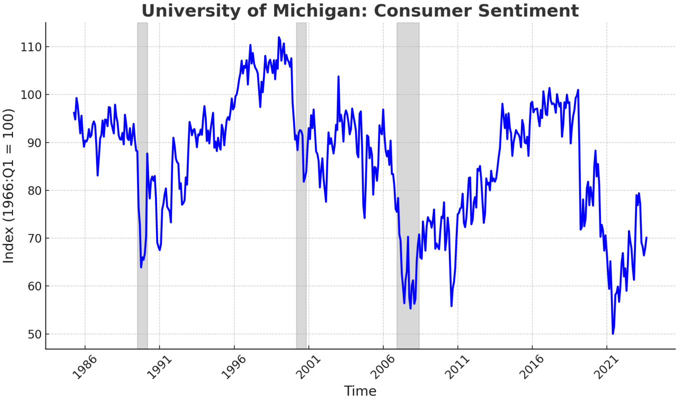
7 variables, **monthly** frequency from 1987:M1 to 2019:M8 (392 obs.):

- **Confidence** (MSC Sentiment Index)
- **Real Home Price Index** (S&P/Case-Shiller US National Index)
- **Consumer Credit**
- **Private Residential Investment**
- **Industrial Production**
- **CPI Inflation**
- **Federal Funds Rate**

University of Michigan's Consumer Sentiment Index

Most used empirical proxy for *confidence* in the US:

- **Monthly** series based on 5 Qs of the MSC
- At least **500** phone interviews each month
- **Preliminary** release exists based on first 10-12 days of the month



- Reduced-form Vector Auto-Regression (VAR)[1]

$$X_t = \mu_t + B(L)X_t + \epsilon_t, \quad \epsilon_t \sim N(0, \Sigma)$$

- Recover Structural form:

$$A_0 X_t = \tilde{\mu}_t + A(L)X_t + \nu_t, \quad \nu_t \sim N(0, I),$$

$$\text{with} \quad \tilde{\mu}_t = A_0 \mu_t, \quad A(L) = A_0 B(L), \quad \Sigma = A_0^{-1} A_0^{-1\prime}$$

! A_0 not unique $\Longrightarrow$ exploit **timing** of MSC for identification:

- **Preliminary release** contains interviews from first days of the month $\Longrightarrow$ Beliefs **not impacted** by contemporaneous shocks (A_0 lower triangular)

[1] Number of lags determined by $\max\{\text{AIC, SBC}\}$

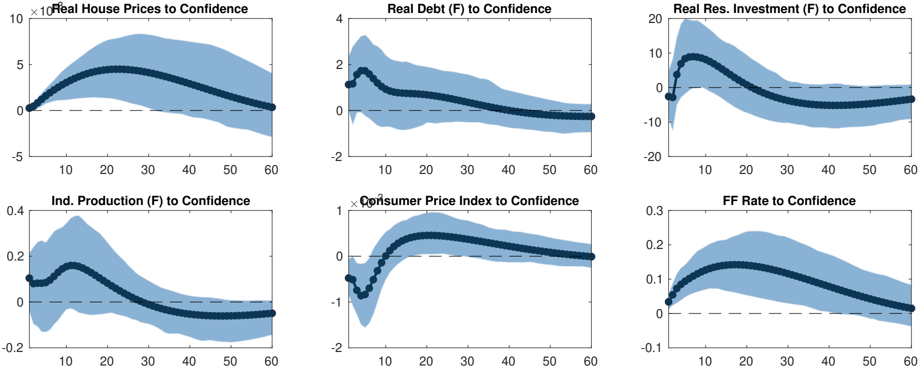


Figure 7: IRFs to a 1-SD shock to confidence with 90% confidence bands

What fraction of House Price forecast error variance is due to each shock?

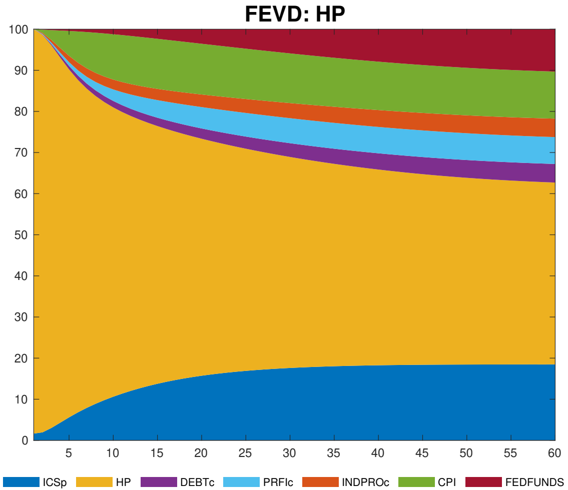


Figure 8: FEVD (%) at 1 to 60 months for house prices

Empirical Evidence: Summary

- Innovations to confidence are identified exploiting the **timing** of the MSC
- Confidence positively impacts **house prices**, **credit**, and **output**
- Confidence shocks explain up to 19% of the house prices over 1987-2019

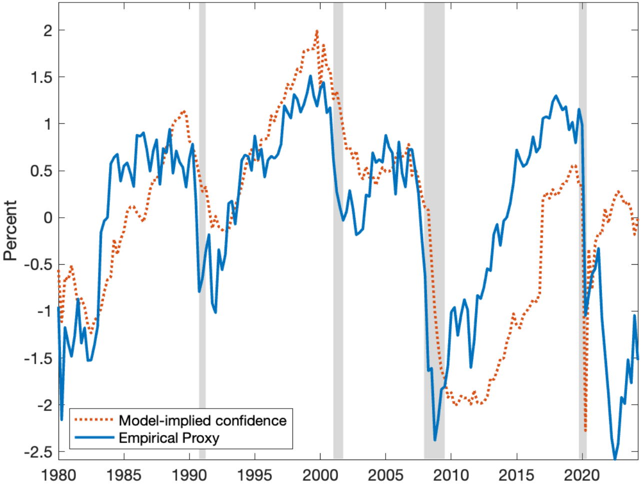


Figure 9: Comparison: Empirical Proxy from MSC v. Model-implied *Confidence* series

(Preliminary) Conclusions

- **Confidence** has macro effects, important for **House Prices**
- It is **quantitatively** important to explain the GFC housing boom & bust
- It represents a **tractable framework** to rationalize *animal spirits* in macro

Appendix

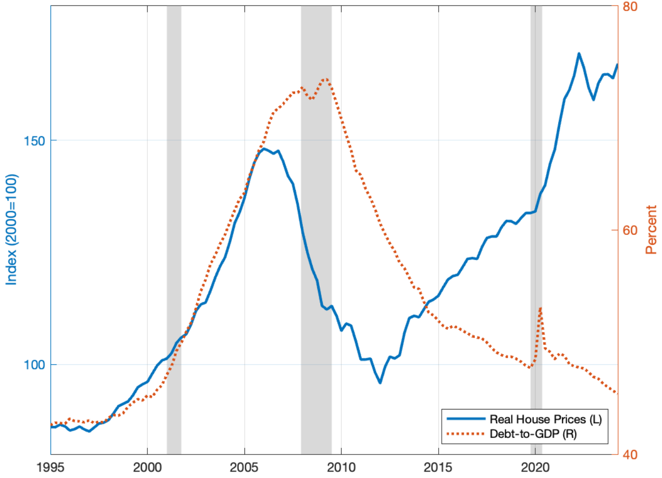


Figure 10: The series for real house prices is the S&P/Case-Shiller US National Home Price Index. Debt-to-GDP is the ratio of nominal home mortgages from the balance sheet of US households & nonprofits over NGDP.

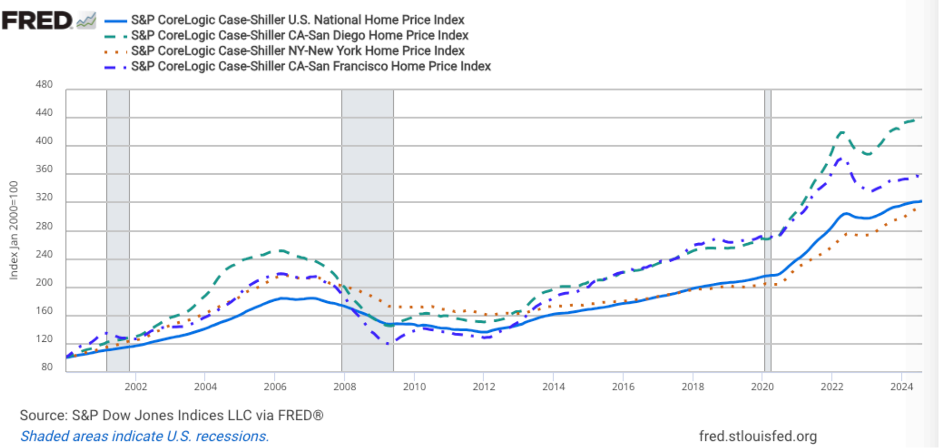


Figure 11: S&P Home Price Index Comparison

News v. Animal Spirits

Back

Two ways of conceiving *confidence*:

1. **"Animal Spirits" Approach:** autonomous fluctuations in beliefs, unrelated to fundamentals, with causal effects on economic activity

2. **"News" Approach:** innovations due to information about the future state of the economy

"Even apart from the instability due to speculation, there is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than on a mathematical expectation, whether moral or hedonistic or economic."

– J.M. KEYNES, *General Theory Of Employment, Interest And Money* (1936)

CES Consumption Bundle

Back

Variable c_{it} is defined as the final good consumed in island i and is a bundle:

$$c_{it} = \left(\int_0^1 (c_{i,j,t})^{1-\rho} \, dj \right)^{\frac{1}{1-\rho}}$$

where $c_{i,j,t}$ is the local good produced in island j demanded by island i

Microfoundations of Systematic Bias

REE (Rational Expectations Equilibria) $\lightning$ persistent biases

- **Camerer & Lovallo (1999, AER)**: Overconfidence in market entry decisions. Participants overestimate their performance $\longrightarrow$ excessive market entry
- **Malmendier & Tate (2005, JoF)**: CEO overconfidence drives overinvestment, reflecting overestimation of returns vs. competitors
- **Mobius et al. (2011, MS)**: Self-confidence in social and economic outcomes. Participants show overestimation biases before tasks
- **Daniel & Hirshleifer (2015, JEP)**: Overconfidence causes higher trading volumes; traders overestimate their private information's precision
- **Benabou & Tirole (2002, QJE)**: Self-confidence impacts motivation and economic outcomes

Equilibrium Conditions (General Case)

Back

Saver's:

$$\lambda_{it} = \beta\,\mathbb{E}_t[\lambda_{i,t+1}(r^k_{i,t+1} + 1 - \delta) \mid \Omega_2]$$
$$\lambda_{it} = \beta\,\mathbb{E}_t[\lambda_{i,t+1} r_{it} \mid \Omega_2]$$
$$q_{it}\lambda_{it} = \Delta_{it} + \beta\,\mathbb{E}_t[q_{i,t+1}\lambda_{i,t+1} \mid \Omega_2]$$
$$w_{it} = \frac{n^{\phi}_{it}}{\mathbb{E}_t[\lambda_{it} \mid \Omega_1]}$$

Borrower's:

$$\tilde{\lambda}_{it} - \mu_{it} = \tilde{\beta}\,\mathbb{E}_t[\lambda^r_{i,t+1} \mid \Omega_2]$$
$$q_{it}\tilde{\lambda}_{it} = \Delta_{it} + \beta\,\mathbb{E}_t[q_{i,t+1}\tilde{\lambda}_{i,t+1} \mid \Omega_2] + M\mu_t q_{it}$$
$$w_{it} = \frac{n^{\phi}_{it}}{\mathbb{E}_t[\lambda_{it} \mid \Omega_1]}$$

Firms':

$$w_{it} n_{it} = (1-\rho)(1-\alpha)\,\mathbb{E}_t[Y^{\rho}_t y^{1-\rho}_{it} \mid \Omega_1]$$
$$r^k_{it} k_{it} = (1-\rho)\alpha\,\mathbb{E}_t[Y^{\rho}_t y^{1-\rho}_{it} \mid \Omega_1]$$

Solution Method

Back

- Limit case: $\sigma \to 0 \Rightarrow$ no heterogeneity across islands
- Loglinear solution is of the form:

$$\underbrace{w_{it}}_{\text{end. variable}} = \Lambda_X \underbrace{X_{t-1}}_{\text{end. state}} + \Lambda_s A_t + \Lambda_{z1} \underbrace{z_{it}}_{\text{signal}} + \Lambda_{z2} \underbrace{\bar{z}_t}_{\text{beliefs on others' signals}} + \Lambda_\Gamma \Gamma_t$$

- Solve for relevant matrices through undetermined coefficients

Full Model: Saver's Problem

Back

$$\max_{c_{it},h_{it},i_{it},d_{it},n_{it}} \mathbb{E}_t \left[\sum_{s=0}^{\infty} \beta^s \log(C_{i,t+s}) + \psi \log(H_{i,t+s}) - \frac{n_{i,t+s}^{1+\nu}}{1+\nu} \right]$$

s.t.

- $C_{it} := c_{it} - H_C C_{i,t-1}, H_{it} := h_{it} - H_H H_{i,t-1}$
- $c_{it} + i_{it} + q_{it} h_{it} + \frac{R_{t-1}}{\pi_t} d_{i,t-1} = d_{it} + q_{it} h_{i,t-1} + w_{it} n_{it} + r_{k,it} k_{i,t-1} + s_{it}$
- $k_{it} = (1-\delta) k_{i,t-1} + i_{it} \left[1 - \frac{\phi_K}{2} \left(\frac{i_{it} - i_{i,t-1}}{i_{SS}} \right) \right]$

The parameters H_C and H_H govern the amount of habit persistence in non-durables/durables

Full Model: Borrower's Problem

Back

$$\max_{c_{it},h_{it},d_{it},n_{it}} \mathbb{E}_t \left[\sum_{s=0}^{\infty} \beta^s \log(C_{i,t+s}) + \psi \log(H_{i,t+s}) - \frac{n_{i,t+s}^{1+\nu}}{1+\nu} \right]$$

s.t.

- $C_{it} := c_{it} - HCC_{i,t-1}, H_{it} := h_{it} - HHH_{i,t-1}$
- $c_{it} + q_{it}h_{it} + \frac{R_{t-1}}{\pi_t} d_{i,t-1} = d_{it} + q_{it}h_{i,t-1} + w_{it}n_{it}$
- $d_{it} \leq Mq_{it}h_{it}$

Full Model: Firms in Island i

Back

A competitive sector of firms produces the local non-durable good:

$$y_{it} = \left(\int_0^1 y_{ijt}^{\frac{\epsilon-1}{\epsilon}} dj \right)^{\frac{\epsilon}{\epsilon-1}}$$

Each intermediate good is produced by a monopolist maximizing profits:

$$\max_{k_{d,ijt}, n_{d,ijt}, p_{ijt}} p_{ijt} y_{ijt} - w_{it} n_{d,ijt} - r_{k,it} k_{d,ijt}$$

s.t.

- $y_{ijt} = A_t (k_{d,ijt})^{\alpha} (n_{d,ijt})^{1-\alpha}$
- $y_{ijt} = \left(\frac{p_{ijt}}{p_{it}} \right)^{-\epsilon} y_{it}$

Pricing à la Calvo

Full Model: Monetary Policy

Back

Monetary policy conducted "on a mainland"

It follows **Taylor rule**, responding to aggregate quantities:

$$R_t = (R_{t-1})^{\rho_R} \left[(R^n_{SS})^{1-\rho_R} \left(\frac{\pi_{A,t}}{\pi_{A,SS}} \right)^{\phi_\pi} \left(\frac{Y_t}{Y_{SS}} \right)^{\phi_Y} \right]^{1-\rho_R}$$

Full Model: Aggregate Shocks

Back

On top of **technology** and **confidence** shock, 5 additional shocks:

- **Consumption-demand**: shifts willingness to spend today w.r.t. tomorrow
- **Housing preference**: shifts MRS between non-durable and durable
- **Investment**: affects technology transforming investment good in capital
- **Monetary policy**: deviation from Taylor rule
- **Leverage**: change LTV ratio in borrowing constraint

Full Model: Estimation

Back

The model is estimated using **Bayesian** methods:

- **Markov Chain Monte Carlo** of 250k draws from posterior distributions through Random Walk Metropolis Hastings
- **Six observables**: non-durable consumption, investment, hours worked, real house prices, CPI inflation, Federal Funds Rate
- Quarterly data from 1980Q1 to 2016Q4 (148 quarters)
- Parameters calibrated to match long-run targets, others Bayes-estimated

Full Model: Calibrated Parameters

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Param.	Description	Value	SS target
β	Saver's discount factor	0.995	2% RR
β	Borrower's discount factor	0.99	d/y = 0.47
ψ	Housing weight in utility	0.013	qh/c = 2.3
M	Maximum LTV ratio	0.85	LTV std.
δ	Capital depreciation	0.025	k/y = 2.1
α	Capital share	0.3	I/y = 0.21
ν	Inverse of Frisch elasticity	1	-
ϵ_P	El. of substitution of goods in one island	6	MarkUp=1.2
ρ	Strategic complementarity between islands	0.75	ACD (2015)

Table 1: Calibrated parameter values

Full Model: Estimated Parameters I

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Param.	Description	Prior (mean, std)	5%	Mean	95%
HC	Non-durable Cons. Habit	Beta (0.7, 0.1)	0.4898	0.5439	0.5954
HH	Durable Cons. Habit	Beta (0.7, 0.1)	0.3366	0.4816	0.6150
ϕ_K	Inv. adj. cost	Gamma (4, 2)	0.2160	0.3390	0.4991
θ_P	Calvo Param.	Beta (0.5, 0.075)	0.7303	0.7643	0.7839
ϕ_π	CB infl. resp.	Normal (1.5, 0.25)	1.5345	1.7380	1.9231
ϕ_Y	CB output resp.	Beta (0.125, 0.03)	0.0460	0.0652	0.0854
ϕ_R	IR smoothing	Beta (0.75, 0.1)	0.3831	0.5042	0.6180

Table 2: Posterior estimates of parameters, based on 250.000 draws from posterior distribution

Full Model: Estimated Parameters II

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Param.	Description	**Prior** (mean, std)	5%	Mean	95%
ρ_a	Tech. shock pers.	Beta (0.75, 0.1)	0.9275	0.9545	0.9805
ρ_z	Demand shock pers.	Beta (0.75, 0.1)	0.8949	0.9104	0.9252
ρ_m	Mon. pol. shock pers.	Beta (0.75, 0.1)	0.5535	0.6396	0.7216
ρ_h	Housing pref. shock pers.	Beta (0.75, 0.1)	0.5754	0.7635	0.9197
ρ_l	Leverage shock pers.	Beta (0.75, 0.1)	0.4716	0.5977	0.7167
ρ_i	Investment shock pers.	Beta (0.75, 0.1)	0.8747	0.9077	0.9368
σ_a	Tech. shock vol.	IGamma (0.01, 2)	0.0048	0.0056	0.0063
σ_z	Demand shock vol.	IGamma (0.01, 2)	0.0110	0.0130	0.0152
σ_m	Mon. pol. shock vol.	IGamma (0.01, 2)	0.0009	0.0010	0.0012
σ_h	Housing pref. shock vol.	IGamma (0.01, 2)	0.0110	0.0143	0.0176
σ_l	Leverage shock vol.	IGamma (0.01, 2)	0.0141	0.0170	0.0197
σ_i	Investment shock vol.	IGamma (0.01, 2)	0.0120	0.0140	0.0159

Table 3: Posterior estimates of parameters, based on 250.000 draws from posterior distribution

Raw Data

Back

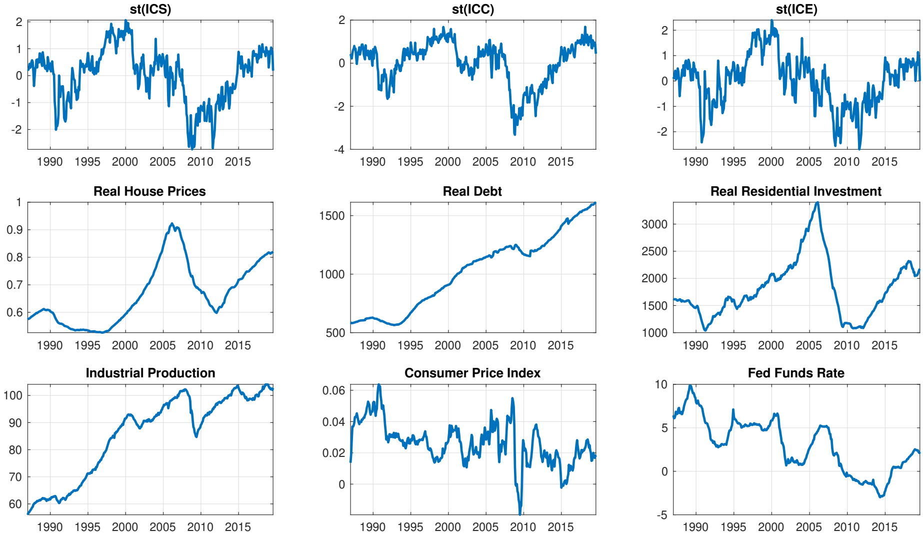

Figure 12: Eyeballing the VAR Data

Transformed Data

Back

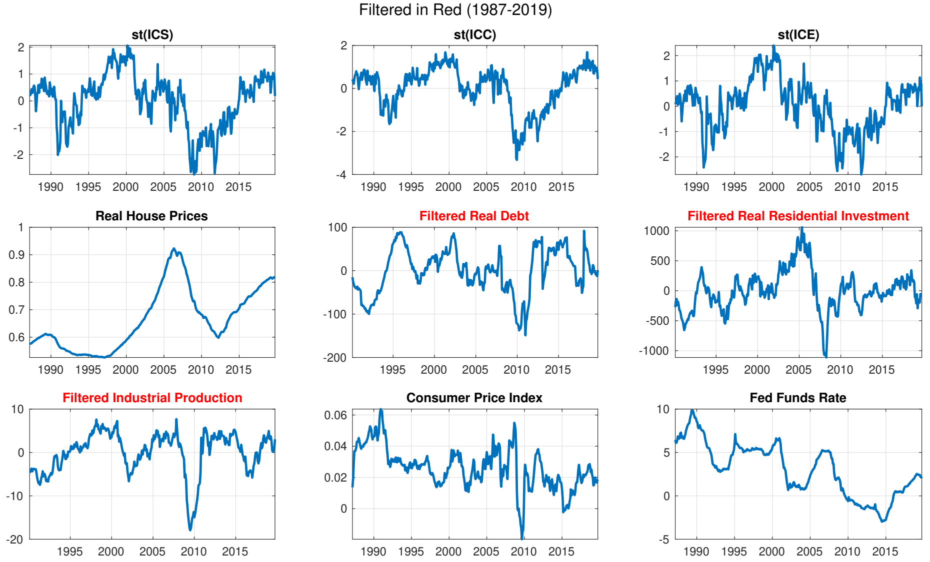

Figure 13: Eyeballing the VAR Data

The Questions

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1. *Do you think that today is a good or a bad time to buy a major household item?*
2. *Do you think that your family is worse off financially with respect to one year ago?*
3. *Do you think that a year from now your family will be better off financially, or worse off, or just about the same as now?*
4. *Do you think that during the next twelve months business conditions in the country will experience good times financially, or bad times, or what?*
5. *Which would you say is more likely, that in the country as a whole we'll have continuous good times during the next five years or so, or that we will have periods of widespread unemployment or depression, or what?*

MP Shocks: Romer & Romer

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	Shocks	
Months	R&R MP	Conf
6	0.06	49.70
12	0.32	54.91
24	1.48	46.92
36	3.27	35.95

Figure 14: Forecast Error Variance Decomposition – Romer & Romer vs. Confidence shocks

Augmented Dickey-Fuller Test

I test the null of presence of unit root under an autoregressive process (AR), an autoregressive process with drift (ARD) and a trend stationary process (TS)

Variable	AR	ARD	TS	p-val AR	p-val ARD	p-val TS
Confidence	1	1	0	0.0017	0.0200	0.0843
House Prices	0	0	0	0.999	0.9899	0.9839
Debt	0	0	0	0.999	0.9516	0.9725
Residential Investment	0	0	0	0.8833	0.9059	0.9789
Industrial Production	0	1	0	0.999	0.0229	0.9497
Consumer Price Index	0	1	1	0.1895	0.0442	0.0128
Fed Funds Rate	0	0	0	0.1281	0.6833	0.9768

Table 4: Augmented Dickey-Fuller Test

- The hypothesis of unit roots cannot be ruled out
- Doesn't impact validity of results
- Filtering rules out any potential concern

Johansen Cointegration Test

Rank	Reject	J-Stat	cValue	pValue
0	1	535.243	125.6176	0.001
1	1	217.818	95.7541	0.001
2	1	133.4343	69.8187	0.001
3	1	80.9464	47.8564	0.001
4	1	33.3701	29.7976	0.019
5	0	11.8192	15.4948	0.166
6	0	2.1819	3.8415	0.140

Table 5: Johansen Cointegration Test

The null hypothesis of cointegration is robustly rejected up to the fourth rank