Liquidity, Trends, and the Great Recession

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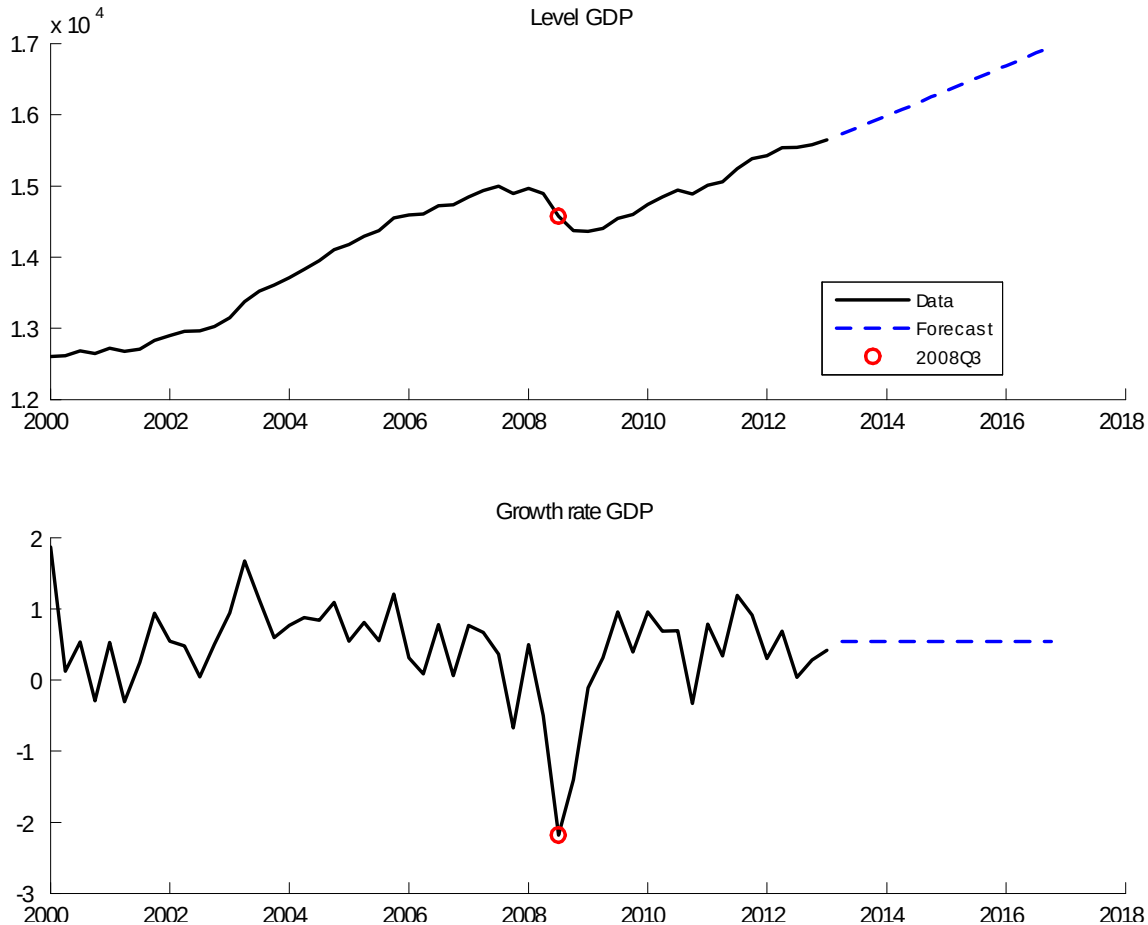
Motivation

- We are interested in the Great Recession.
- Studying it is important for
  1. the present (what should we do now?)
  2. the future (how can we avert it?).
- It is a multidimensional event.
- We focus on 2 observations.

Fact 1

The U.S. growth trend permanently shifted.



Fact 2

A severe liquidity crunch coincided.

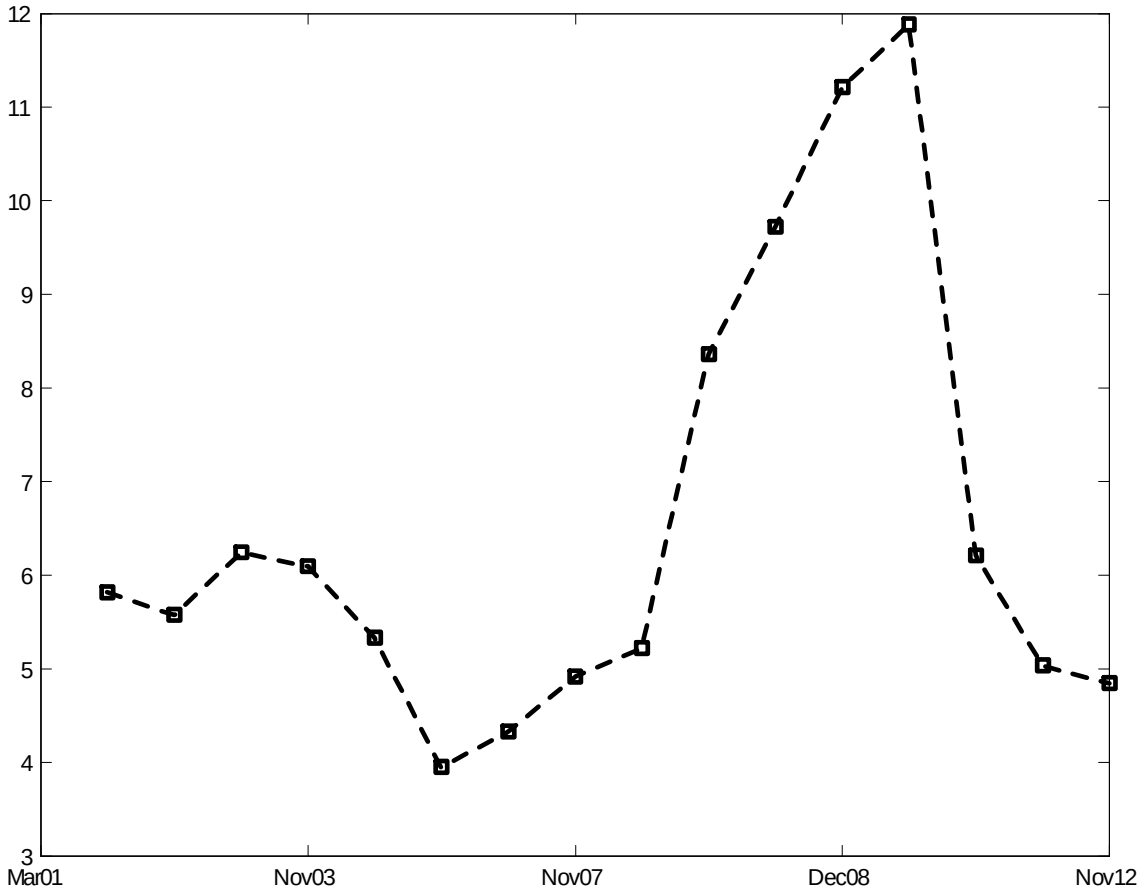


Figure: Margins for S&P 500 futures.

What we do

- We thought facts 1&2 are interconnected.
- Liquidity crunch might cause a shift in the trend.
- We augment two strands of literature.
  1. Growth: Romer (1990).
  2. Liquidity: Kiyotaki and Moore (1997; 2012).
- We estimate the model by Bayesian methods.
- We found that the liquidity did matter.

Related literatures

- Growth: Acemoglu and his coauthors, Aghion and Howitt (1998), Grossman and Helpman (1991), Romer (1986; 1990), and so on.
- Financial Frictions: Ajello (2012), Bernanke, Gertler, and Gilchrist (1999), Christiano, Motto, and Rostagno (2014), Del Negro, Eggertsson, Ferrero, and Kiyotaki (2011), Jermann and Quadrini (2012), Kiyotaki and Moore (1997; 2012), and so on.
- Macroeconometrics: Fernández-Villaverde, Guerrón-Quintana, and Rubio-Ramírez (2010), and Smets and Wouters (2003, 2007), and so on.
- We are close to Comin and Gertler (2006), Kung and Schmid (JoF forthcoming), and Shi (2012).

Model

Agents

- Households.
- Final good producers.
- Intermediate goods producers.
- The government.

Households

- The following setup is based on Shi (2012):
  1. A continuum of households with measure one.
  2. Each household has unit measure of members.
  3. Some members become entrepreneurs; others become workers.
  4. Member's role ex ante unknown; and re-shuffled every period.

Time line

- Events in a period proceed as follows:
  1. Household head evenly splits the assets among the members, and gives contingency plans to the members. Members depart.
  2. Member's roles realize. Goods produced. Both tangible and intangible capital depreciate. Markets open and people trade. People consume.
  3. Markets close. Members come back to the household. Investment to physical capital takes place in the backyard.

Entrepreneurs (what they do)

- Implement product development projects
- Convert s_t units of final goods to $\vartheta_t s_t$ units of new products.
- Sunk entry costs and exogenous exits (Bilbiie, Ghironi, and Melitz (2012)).
- Receive income from assets.
- Consume, trade assets, and pay lump-sum tax.

Workers (what they do)

- Supply labor l_t, and set aside recource for investment i_t.
- Receive wage income and income from assets.
- Consume, trade assets, and pay lump-sum tax.
- i_t is collected at night by the household head, used for investment.

Household's problem

The household maximizes the value function defined as:

$$v_t = \max \left\{ u\left(c_t^e, c_t^w, l_t\right) + \beta_t E_t \left[v_{t+1} \right] \right\}$$

where u is the population-weighted average utility

$$u\left(c_t^e, c_t^w, l_t\right) = \sigma_e \log\left(c_t^e\right) + \left(1 - \sigma_e\right) \left[\log\left(c_t^w\right) - \psi_t \frac{l_t^{1+\zeta}}{1+\zeta} \right]$$

subject to budget constraints and *liquidity constraints*.

Liquidity constraints

- Limit speed of asset sales.
- One can sell within a period up to
  1. a fraction θ of newly developed products
  2. a fraction ϕ_t of existing assets (both products and capital)
- Effectively introduce lower bounds on asset holdings.

Liquidity constraints

- We assume that $1 < \underbrace{\vartheta_t p_{n,t}}_{\text{marginal revenue}} < 1/\theta$ always holds.
- R&D is profitable but requires downpayment.
- Implication: *entrepreneurs are always liquidity constrained.*

Liquidity shocks

- Our timing assumption makes within-household direct finance not an option.
- Providing liquidity to entrepreneurs has to be done through asset markets.
- Liquidity condition ϕ_t affects the efficiency in transferring funds.

Production sector

- Final goods are produced by

$$Y_t = \left((KS_t)^{\alpha} (A_t L_t)^{1-\alpha} \right)^{1-\xi} G_t^{\xi}$$

- Composite intermediate good is produced by

$$G_t = \left[\int_0^{N_t} X_{i,t}^{\frac{1}{\nu}} di \right]^{\nu}$$

- Intermediate goods are produced by roundabout technology.

- Variety effect.

- N_t evolves according to $N_{t+1} = (1 - \delta_n) N_t + \vartheta_t (\sigma_e s_t)$.

R&D efficiency

- Product development efficiency ϑ_t is given by

$$\vartheta_t = \underbrace{\chi_t}_{\text{sector-specific shock}} \left(\frac{\underbrace{N_t}_{\text{product varieties}}}{\underbrace{\sigma_e s_t}_{\text{aggregate R\&D}}} \right)^{1-\eta}$$

- Knowledge spillover and congestion externality.
- *A recession might leave permanent scars on the economy.*

Equilibrium

- Competitive equilibrium is defined in a standard way.
- There are 6 structural shocks:
  1. ϕ_t (liquidity shock)
  2. A_t (neutral productivity shock)
  3. χ_t (R&D sector-specific productivity shock)
  4. τ_t (government spending shock)
  5. β_t (discount rate shock)
  6. ψ_t (labor disutility shock)
- Shocks follow AR(1) processes:

$$\log \frac{\varsigma_t}{\varsigma} = \rho_\varsigma \log \frac{\varsigma_{t-1}}{\varsigma} + \sigma_\varsigma \varepsilon_{\varsigma,t}$$

Estimation

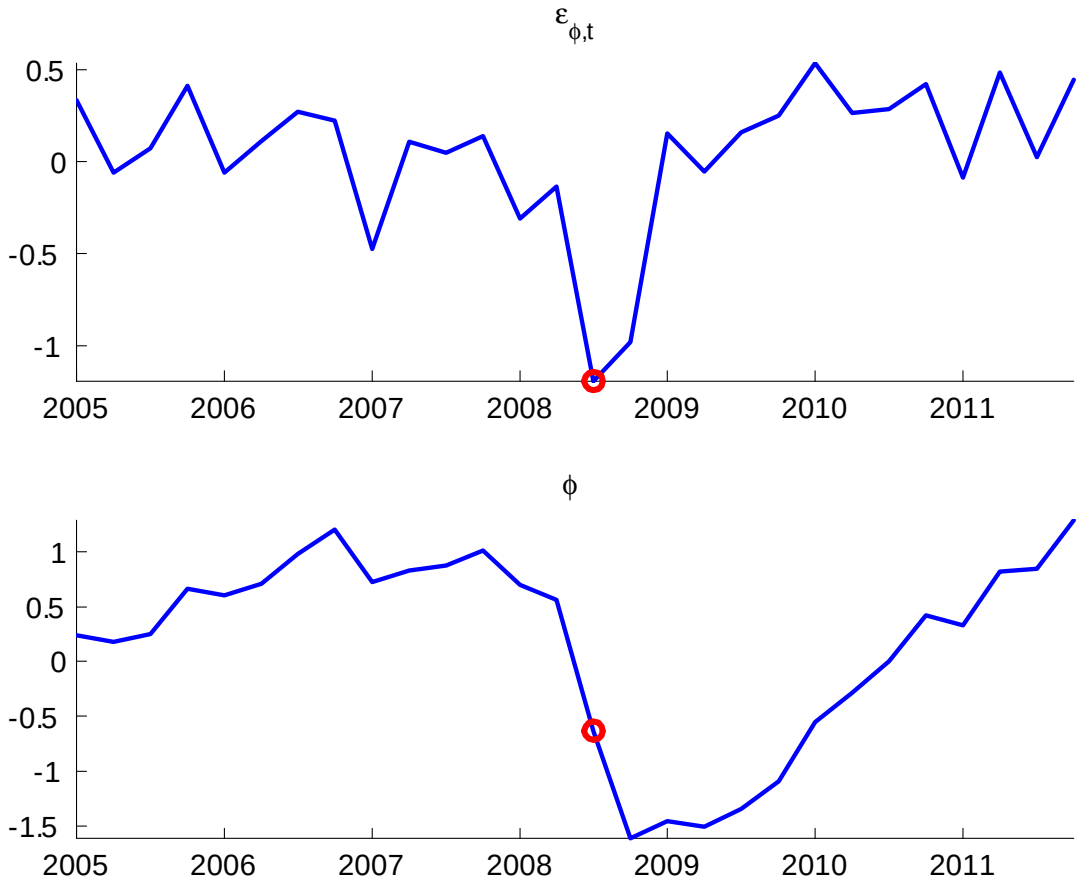
Data/Estimation

- We take a conservative approach.
  1. Set most parameters to match great ratios.
  2. Estimate stochastic processes.
- We use quarterly data 1970Q1 - 2011Q4.

  dY, dC, dInvt, dW, lab, dS
- S: intangible investment series from Nakamura (2003).
- *No financial variables used for estimation.*

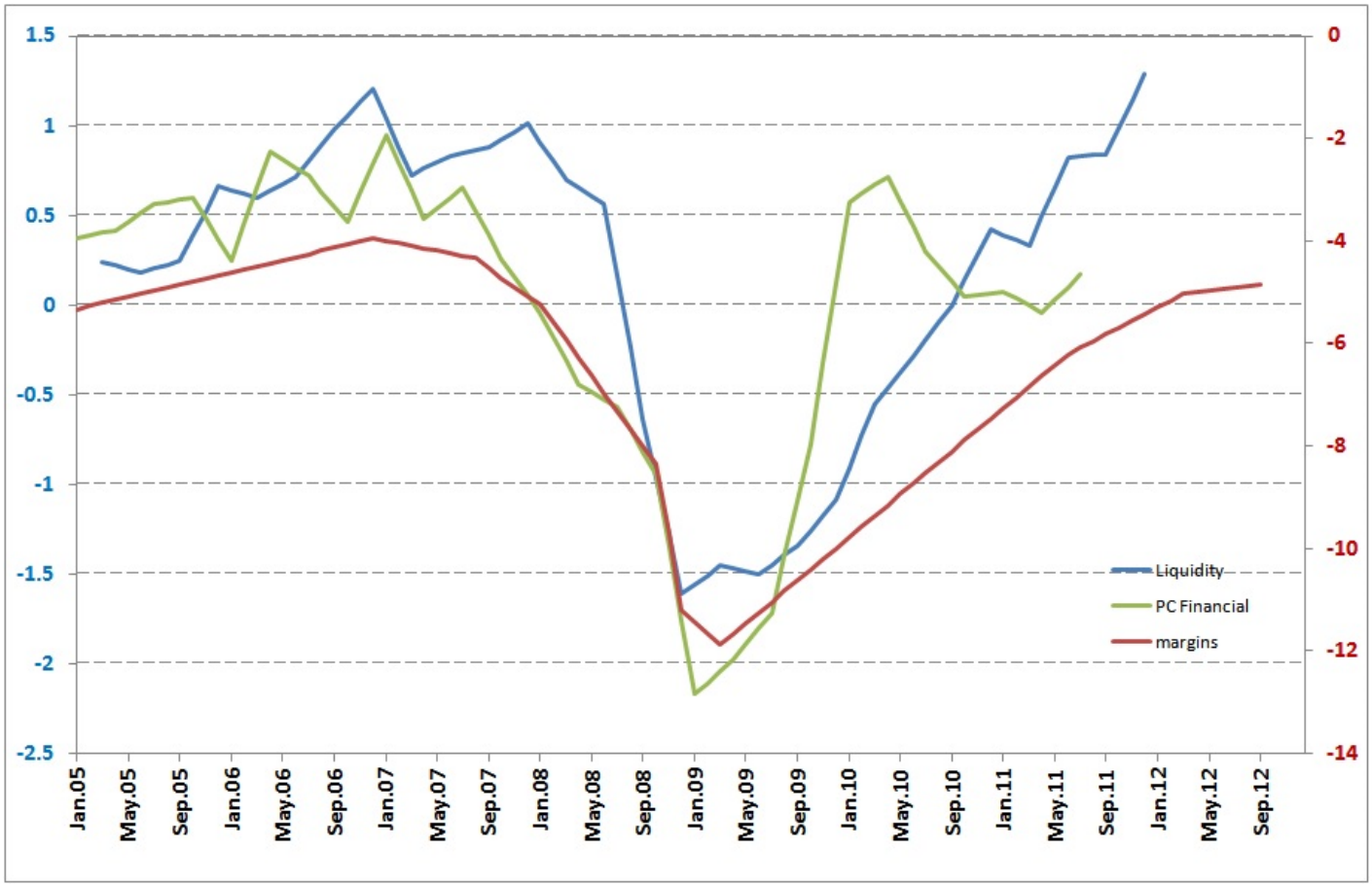
Liquidity shocks

The model picks up negative liquidity shocks in 08.Q3 and 08.Q4.



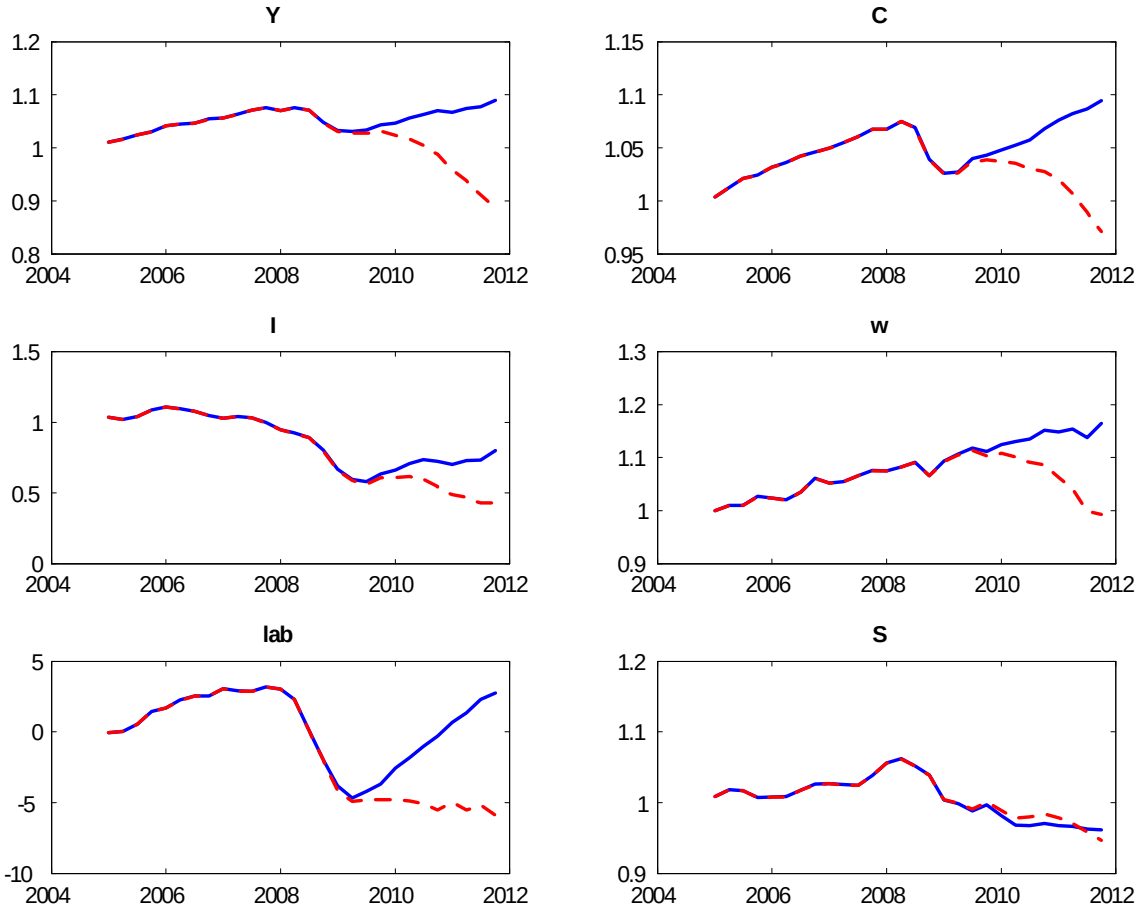
Model (liquidity) and data (margin and SW), side by side

A picture is worth 1,000 words.



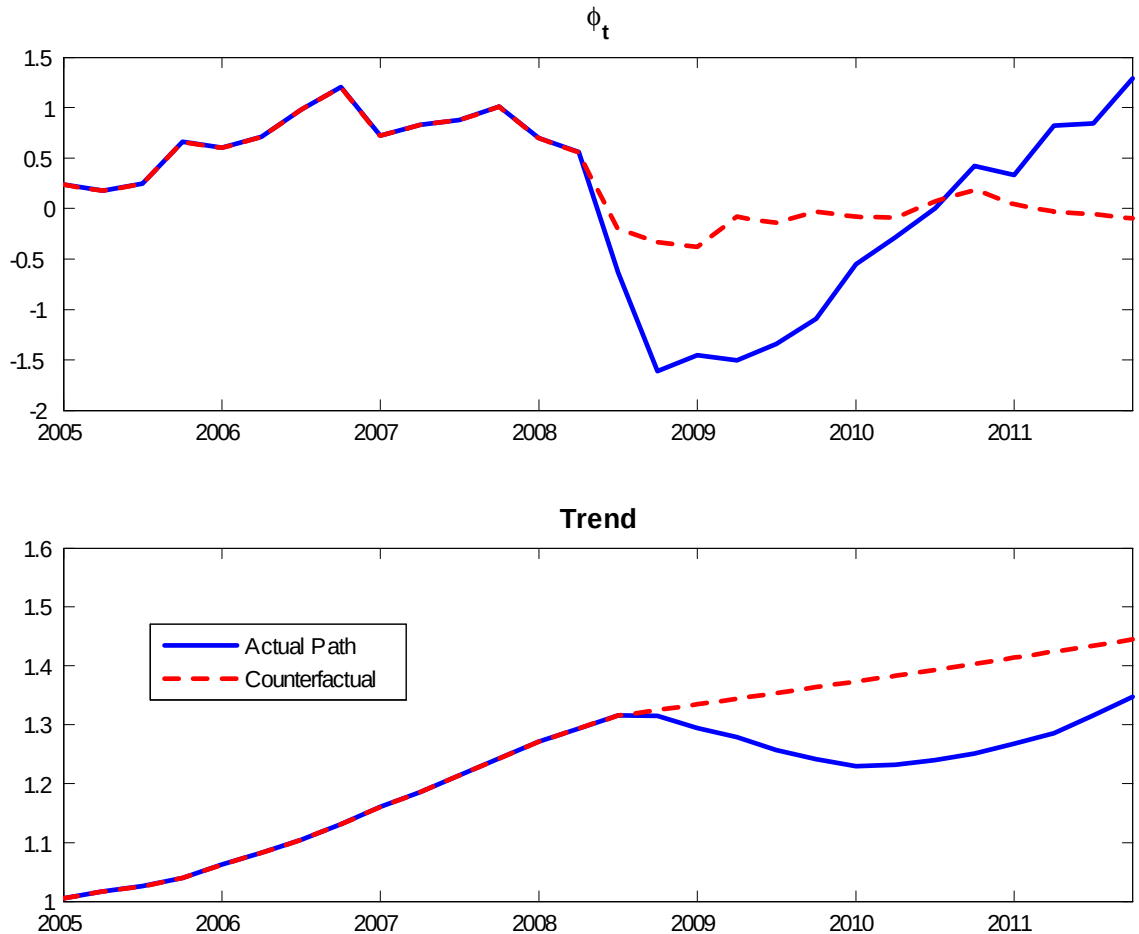
If liquidity had not recovered,

we could have had another great depression.



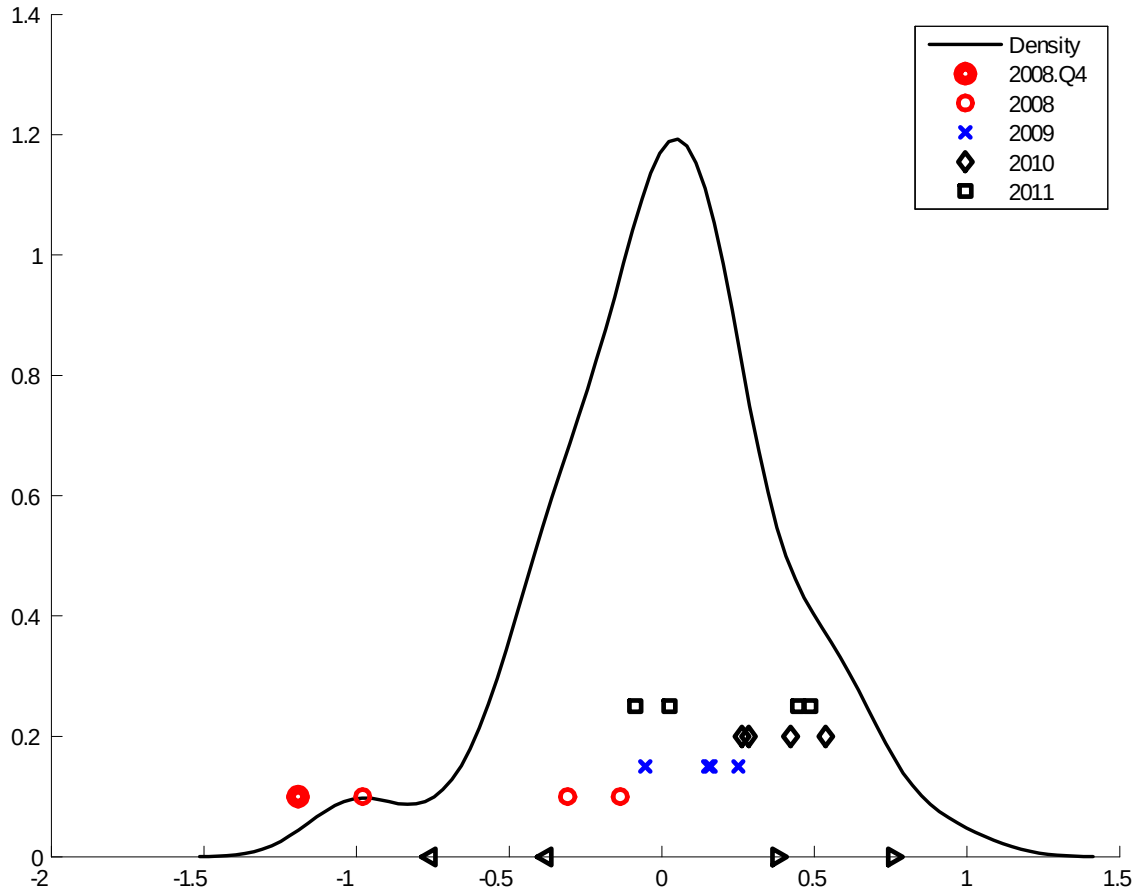
No liquidity crunch,

no recession.



How likely was the Lehman shock?

It was a very unlikely event.



to history

RBC model

- No R&D sector.
- Unit root productivity shock.
- Liquidity constrained investors (Shi (2012)).
- Other elements are standard.
- We estimate it using the same set of data except for intangible investment.

Messages from RBC model

1. Favorable liquidity condition around the Lehman's collapse.
   - Counterfactual in light of the micro evidence.
2. Liquidity condition unimportant for the Great Recession.
   - Not in accordance with the emerging consensus.
3. Negative productivity shock in 08.Q4 was almost everything.
   - But exactly what is it?

Concluding remarks

- We studied the Great Recession.
- We found that liquidity did matter.
- We found that the liquidity shock was a tail event.

Concluding remarks

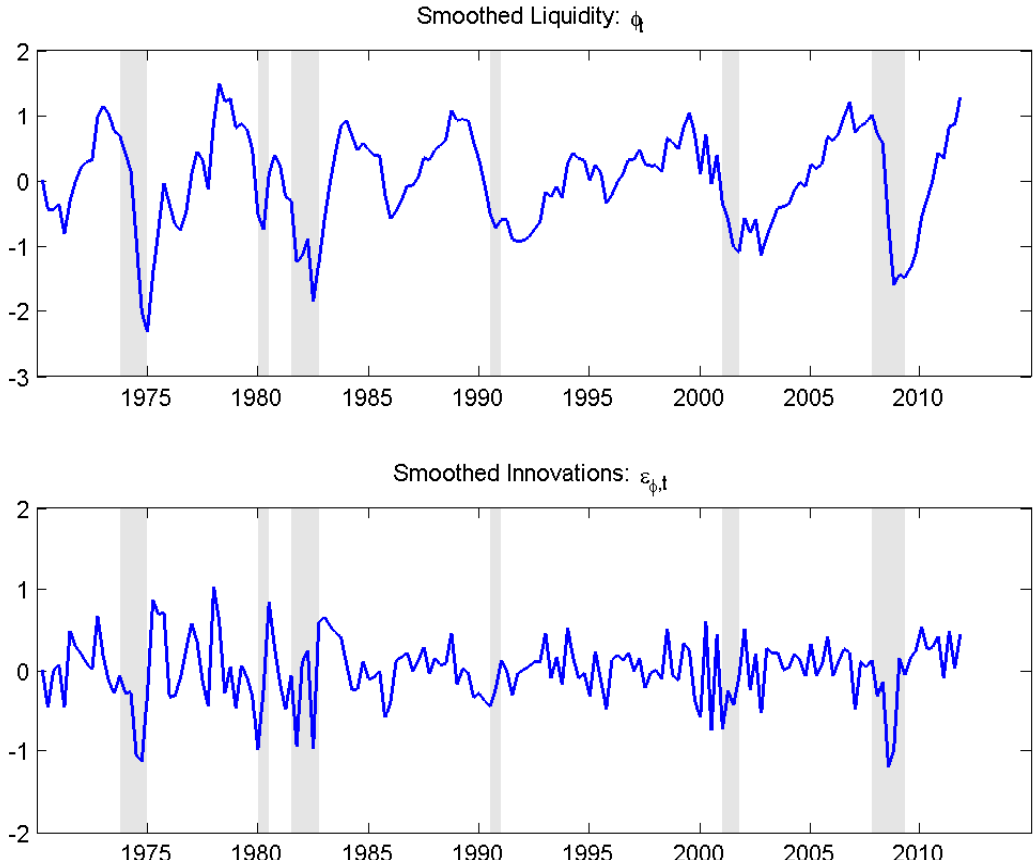
- We are currently working on:
  1. Asset prices.
  2. Fiscal multipliers.
  3. Policies that bring the economy back to the pre-recession trend (Kocherlakota (2014)).
- They are coming soon.

▸ to productivity ▸ to history

Appendix

History

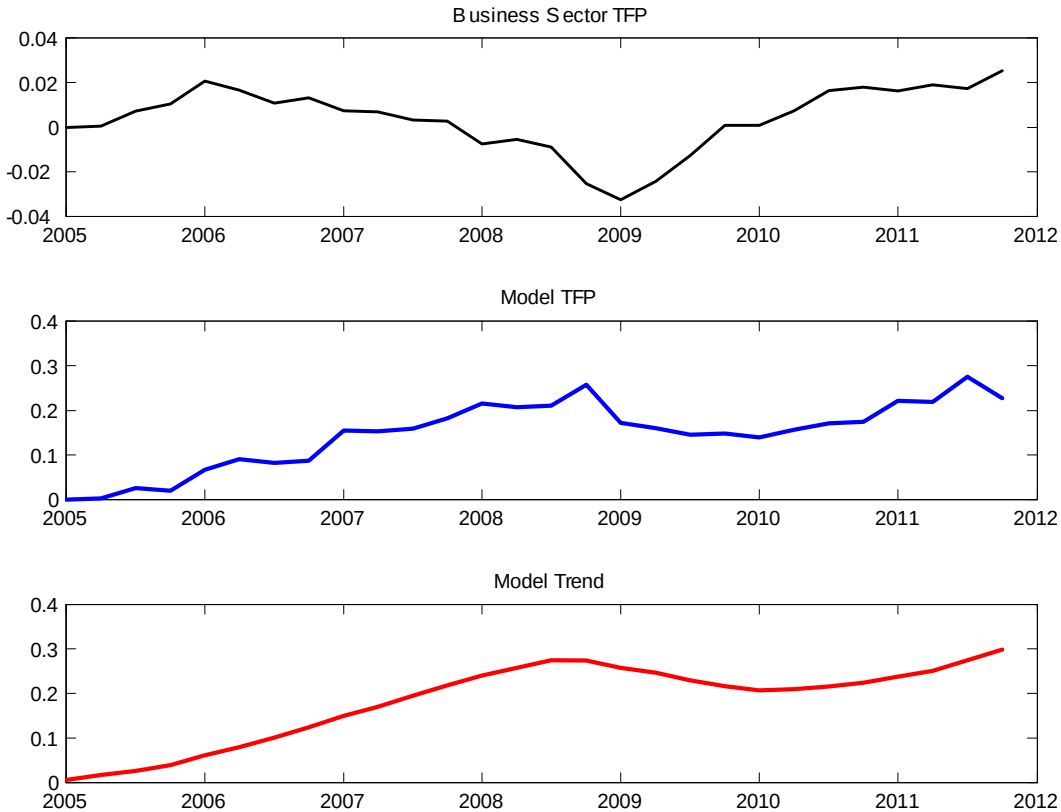
Tight in 1975, 1980/82, and 1987 (the Black Monday).



▸ to density ▸ to conclusion

Productivity

The productivity recovery may be weaker than it looks.



▸ to conclusion