Discussion of:
Structural Models of Inflation Dynamics

By

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Motivation for this Session

- A Key Motivation of the IPN:
  - Develop Facts About Firm Pricing that will Help Us to Discriminate Between Alternative Models of the Monetary Transmission Mechanism

- The Questions Being Asked are Motivated By Models

- It is Appropriate to Devote Some Resources to Developing Models.

- In This Session, Mark Gertler and I Reviewed 8 Papers

Papers that I Studied:

- Coenen and Levin, Identifying the Influences of Nominal and Real Rigidities in Aggregate Price-Setting Behavior

- De Walque, Smets and Wouters, Price Setting in General Equilibrium: Alternative Specifications

- Rumler, Estimates of the Open Economy New Keynesian Phillips Curve for Euro Area Countries

- Whelan, Staggered Price Contracts and Inflation Persistence: Some General Results

Increasing Short-Run Marginal Cost

- Several Papers Have in Common:
  - Assumption that In Short Run, Key Factors of Production are In Fixed Supply
  - Leads to Increasing Marginal Costs of Production

- In Past Year there Has Been a Sudden Burst of Activity on This

Increasing Short-Run Marginal Cost, Cont'd

- Several Papers Written Simultaneously

  - De Walque, Smets and Wouters
  - Eichenbaum and Fisher
  - Coenen and Levin
  - Altig, Christiano, Eichenbaum and Linde
  - Sveen and Weinke

- What's All the Fuss About?

Increasing Short-Run Marginal Cost, Cont'd

- Work on Short-Run Increasing Marginal Cost Triggered By 'Crisis' Created by Empirical Studies of Micro Data in US.

- Empirical Studies:
  - Bils and Klenow
  - Klenow and Kryvtsov
  - Golosov and Lucas

- 'Crisis' is a Only a Taste of What Will Happen as a Result of the Much More Ambitious and Wide-Ranging Efforts of IPN

Crisis: Apparent Macro/Micro Conflict In Monetary Models

- ## Macro Evidence:
  - Prices Appear to be Inertial
  - Empirically Fit Calvo Model Implies Prices Reoptimized on Average Every 5.8 Quarters

- ## Micro Evidence:
  - Prices Change Frequently, Roughly Every 1.5 Quarters

- ## Micro and Macro in Conflict

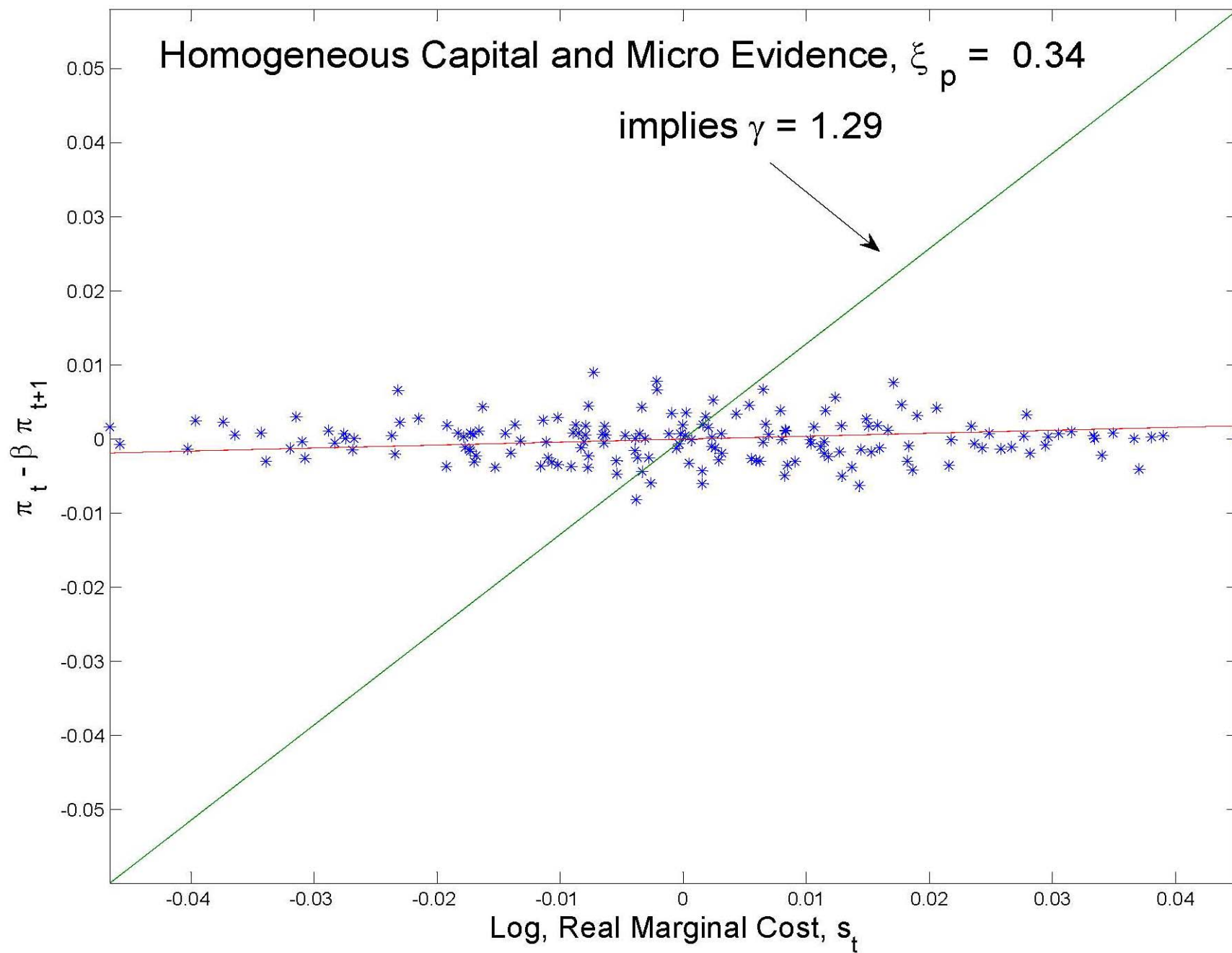# Calvo Model

- Inference of Long Price-Stickiness in Calvo:

$$\hat{\pi}_t = \beta E_t \hat{\pi}_{t+1} + \gamma \hat{s}_t$$

$$\gamma = \frac{\left(1 - \xi_p\right)\left(1 - \beta \xi_p\right)}{\xi_p}$$

$$\gamma = 0.035 \rightarrow \xi_p = 0.83, \ \frac{1}{1 - \xi_p} = 5.8$$

Why Do Prices Look So Sticky Through the Lense of Calvo?

Analysis of relation, $\pi_t = \gamma s_t + \beta \pi_{t+1}$

Homogeneous Capital and Micro Evidence, $\xi_p = 0.34$

implies $\gamma = 1.29$

$\pi_t - \beta \pi_{t+1}$

Log, Real Marginal Cost, s_t

Macro/Micro Conflict

- In Aggregate Data, Price Seems to Respond Very Little to Marginal Cost

- Calvo Interprets this as Reflecting Price Setting Frictions

- Problem: US Micro Data Suggests Weak Frictions

Possible (Unlikely) Resolution

- Bils-Klenow/Klenow-Kryvtsov/Golosov-Lucas:
  - Evidence is on Price *Changes*
  - Not on Price Reoptimization

- In Standard Implementation of Calvo Model:
  - Prices Change All the Time
  - Prices Reoptimized Only Periodically

- Important Question for IPN:
  - How Often are Prices *Reoptimized*?
  - Tentative Answer: At Least as Often as Prices are Changed

Alternative Possible Resolution:

- Firms Set Prices as Flexibly as in US Micro Data

- When they Change their Prices, They Do So By Only a Small Amount

- This is Because of Increasing Marginal Cost
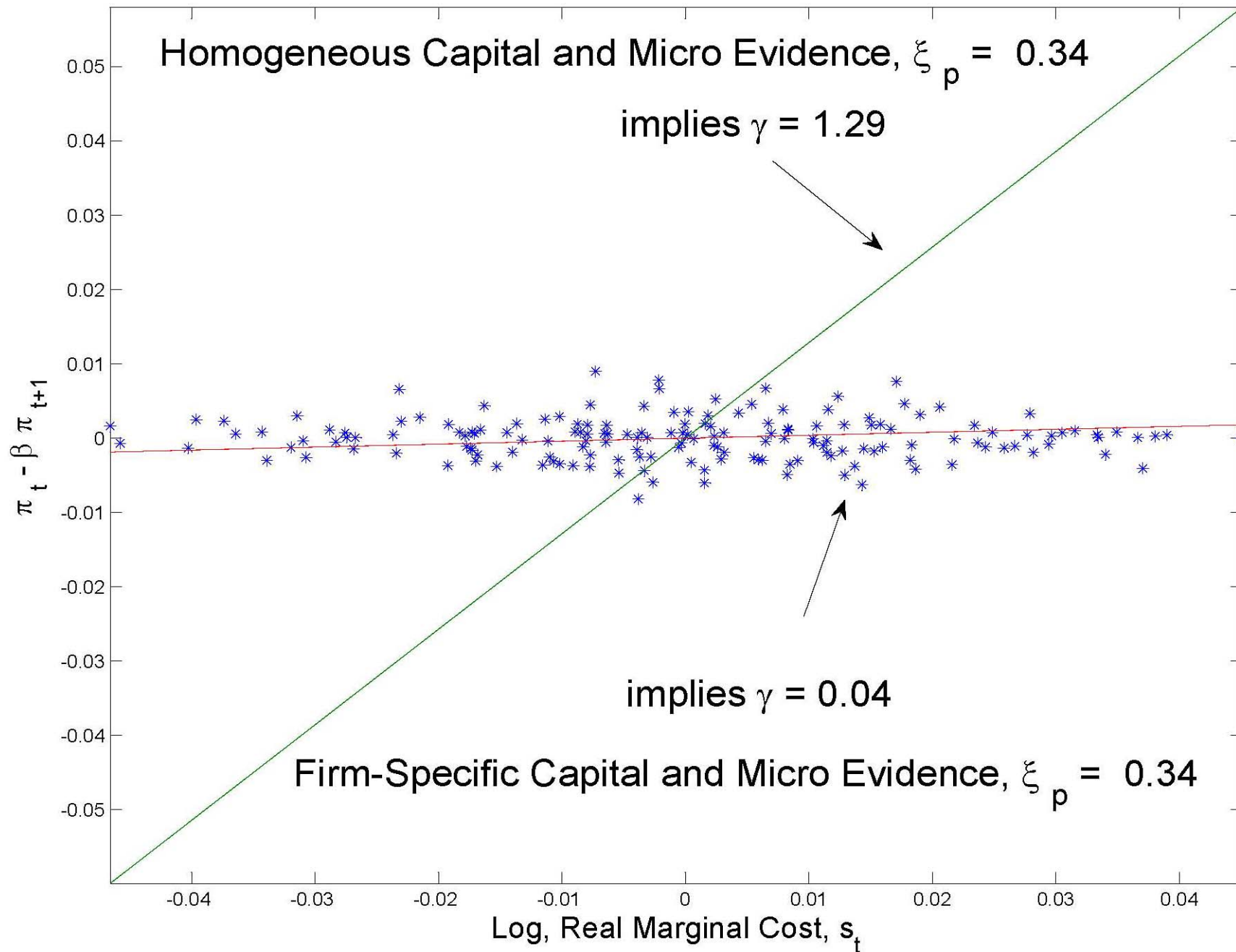
Alternative Possible Resolution, cnt'd

- Standard Model:
  - All Factors of Production are Homogeneous and Traded in Anonymous Factor Markets
  - Linear Homogeneity of Production Implies Constant Marginal Cost
- Alternative Model:
  - There is Some Fixed Factor (Capital)
  - Firm Can Only Change This Over Time
  - Increasing Marginal Costs
  - Lots of Other Possibilities: Labor Adjustment Costs, Land, Time Delays to Order Intermediate Goods…
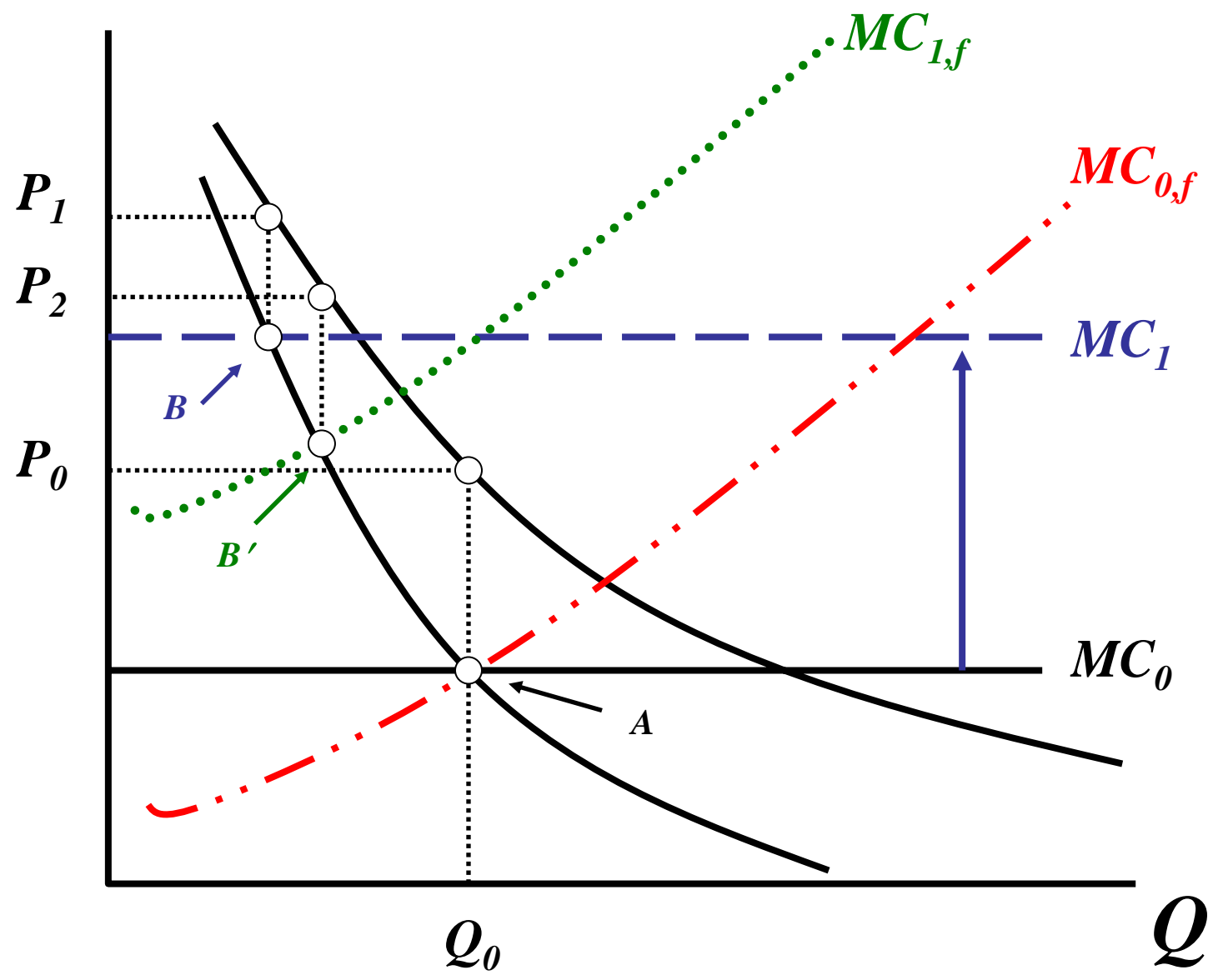
Intuition: Rising Marginal Cost and Incentive to Raise Price

- A Firm Contemplates Raising Price
  - This Implies Output Falls
  - Marginal Cost Falls
  - Incentive to Raise Price Falls
- Effect Quantitatively Important When:
  - Demand Elastic (Lots of Competition and/or Kimball 'Kink')
  - Marginal Cost Steep

Analysis of relation, $\pi_t = \gamma s_t + \beta \pi_{t+1}$

Homogeneous Capital and Micro Evidence, $\xi_p = 0.34$

implies $\gamma = 1.29$

implies $\gamma = 0.04$

Firm-Specific Capital and Micro Evidence, $\xi_p = 0.34$

$\pi_t - \beta \pi_{t+1}$

Log, Real Marginal Cost, s_t

Resolution of Micro/Macro Conflict

- Work on Firm-Specific Factors Was Stimulated by Micro Evidence

- I Expect the Evidence from PIN To Stimulate Much More Work

- Questions:
  - How Often Prices *Reoptimized*?
  - Does Frequency of Price Adjustment Vary Over Time and in Response to Shocks (Tentative Evidence from Klenow-Kryvtsov: No)

Other Questions

- Rumler Paper: Looks at Calvo Equation in Open Economy Setting.
- Asks: How Does Going to Open Economy Change Estimate of Price Frictions?
- Adopts Producer-Currency-Pricing Model
  - Should Also Look at Pricing-to-Market Model
  - Should Display Analog of Above Scatter Plot, To See Effects of Different Assumptions
- For IPN: Useful to Investigate How Prices are Set in International Context: PCP, PTM, Other?

Another Message from Model Analysis

- Wage Frictions Seem Important in Monetary Transmission Mechanism

- Evidence:

  - GGL:

    $$\text{Log } MPlabor = \log w = \log MRS$$

    Left equality holds better over cycle than right equality, Consistent With Little Price Frictions, and Lot's of Wage (Labor Market) Frictions

  - CCE – Sticky Wages Important In Monetary Transmission Mechanism

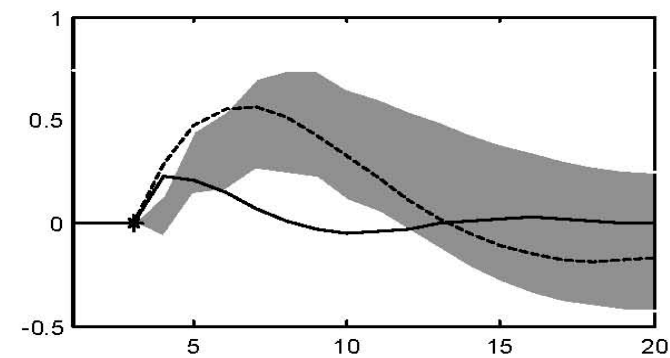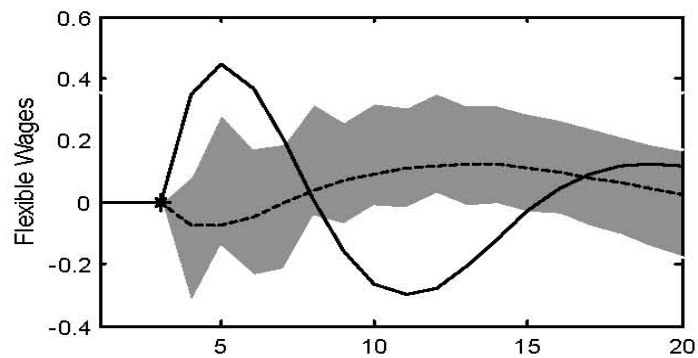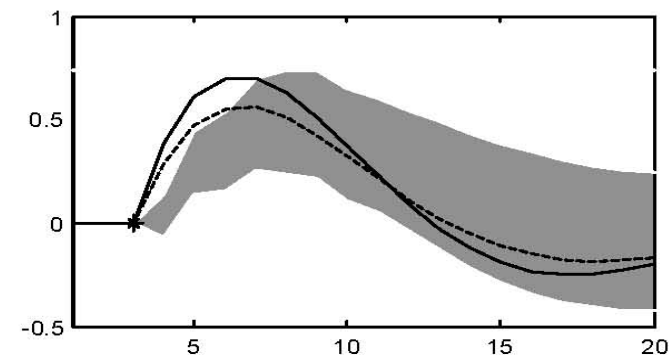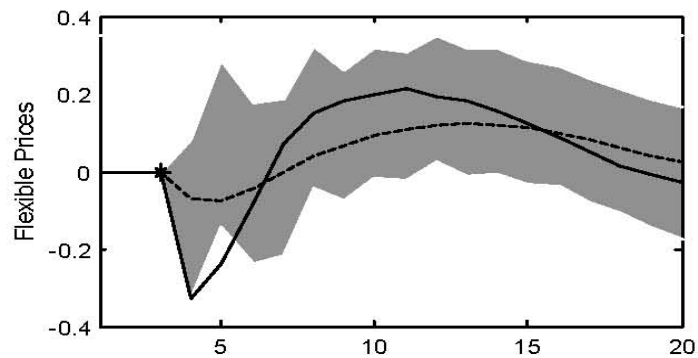# From Christiano-Eichenbaum-Evans (JPE, 2005)

Response to Expansionary Monetary Policy Shock

Dashed Line - Estimated DSGE Model

Solid Line   - Perturbed Model

Sticky Wages

- What Are Sticky Wages Standing In For?

- One Possibility: Wages *Are* Sticky *and this Matters for Allocations*

- To Fully Understand Monetary Transmission Mechanism Need IPN for Wages!

Karl Whelan Paper

- Taylor Sticky Prices Fail to Reproduce Observed Persistence in Inflation

- This Seems Not a Problem for Calvo Sticky Prices

- Regression in ACEL Model, with x(t)=dy(t), x(t)=hours(t)

infl(t) = const + rho*infl(t-1) + psi1*dinfl(t-1) + … + psi3*dinfl(t-3)

+ bet1*x(t-1) + ….. + bet3*x(t-3)

rho=0.92 (with no indexing), rho=0.94 (with full indexing)

Coenen and Levin Paper

- Very Interesting Paper!

- One Result – Estimates of Probability of Price Change Suggest This Varies With Time Elapsed Since Most Recent Price Change

- Not Clear Results are Statistically Significantly Different From Constant 65% Calvo Probability for Quarterly Data Estimated in ACEL

  - C-L Reported Standard Errors on Hazards Large
  - Not Clear How to Interpret Standard Errors for Testing Calvo Null Hypothesis, Since Calvo Probability Not Identified Separately from Gamma Under Null.

Conclusion

- Very Interesting Papers!

- Including this type of Work in IPN Important

- We Also Need to Know About Wages!