Discussion of:
Structural Models of Inflation Dynamics

By
Lawrence J. Christiano
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:

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

\[ \gamma = \frac{(1 - \xi_p)(1 - \beta \xi_p)}{\xi_p} \]

\[ \gamma = 0.035 \rightarrow \xi_p = 0.83, \quad \frac{1}{1 - \xi_p} = 5.8 \]
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 $\gamma = 1.29$
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 $\gamma = 1.29$

Firm-Specific Capital and Micro Evidence, $\xi_p = 0.34$
implies $\gamma = 0.04$
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:
    \[
    \log MP_{Labor} = \log w = \log MRS
    \]
    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

Inflation

Output
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 \( x(t) = dy(t), x(t) = \text{hours}(t) \)

\[
\text{infl}(t) = \text{const} + \rho \times \text{infl}(t-1) + \psi_1 \times \text{dinf}(t-1) + \ldots + \psi_3 \times \text{dinf}(t-3) \\
+ \beta_1 \times x(t-1) + \ldots + \beta_3 \times x(t-3)
\]

\( \rho = 0.92 \) (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
Conclusion

• Very Interesting Papers!

• Including this type of Work in IPN

• We Also Need to Know About Wages!