

# **Discipline and challenges from micro pricing studies**

a discussion of

***On the implications of micro price data  
for macro models***

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# Reading this paper



# Three key ideas

1. How much we've learned in recent years, by considering situation in 1990s
2. The discipline of the new micro data for macro models
3. The challenges of the new micro data for macro models

# 1. How much we've learned since the early 1990s

- Calvo model (**exogenous timing** of adjustment, **endogenous size** of adjustment) seemed to capture key features of available micro price data
- Discrete and occasional adjustment, unequal intervals of fixity for a given product across time
- But there were few empirical studies

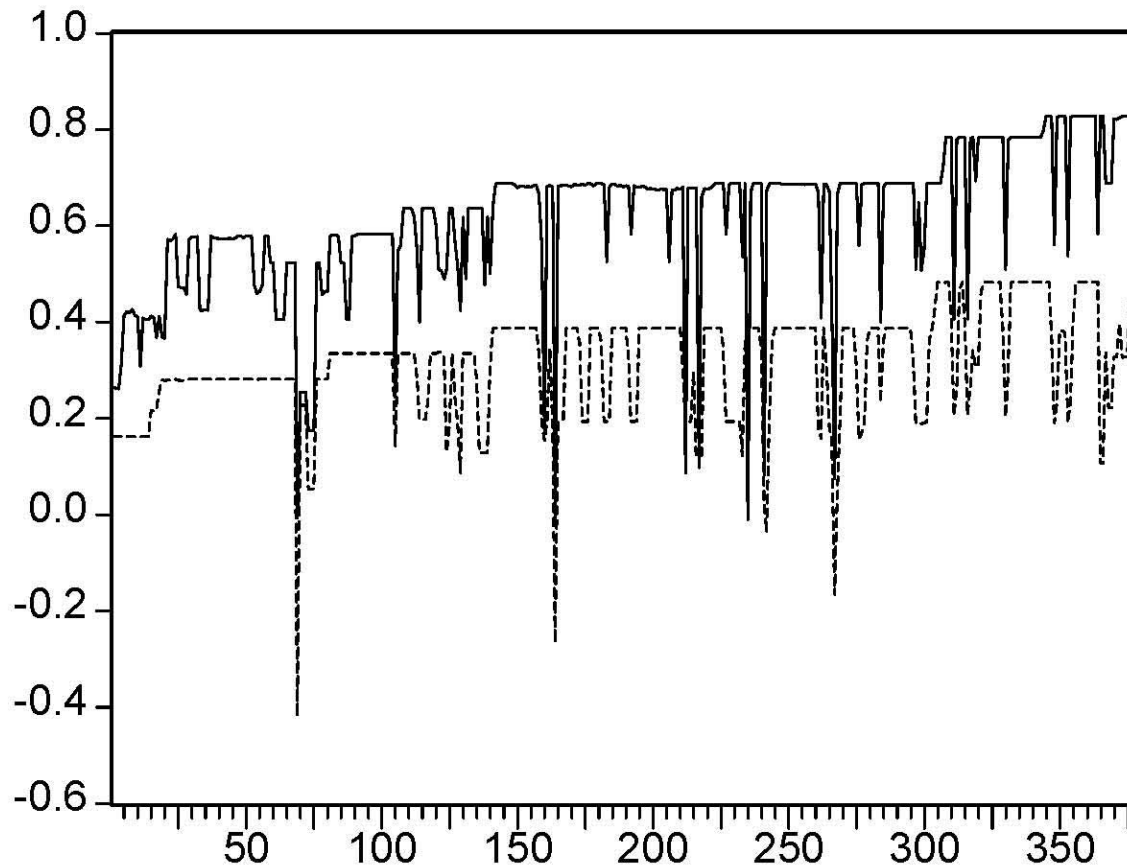
# Sticky price models for monetary policy analysis

- Calvo framework was used in early DSGE models (such as Yun (1996)) because it made aggregation of prices easy and it thereby minimized the “state vector”
- Such early DSGE models with Calvo price dynamics provided strong support for inflation targeting, as in King and Wolman’s (1996) analysis of a “St. Louis model for the 21<sup>st</sup> century”

# Price dynamics

(source: Rotemberg, "Customer Anger...")

Nabisco Premium Saltines 16oz.



— log(avg. retail)    - - - - log(avg. acquisition)

# Wealth of new information

- Frequency of adjustment
  - Varies widely across goods
  - Differs across countries
  - Differs across indices (CPI, PPI)
  - Is complicated (sales, substitutions)
  - Is puzzling on some statistical terms (downward sloping hazards)
- Summarized and evaluated nicely by MS

## 2. The discipline

- Inflation persistence is a key issue
  - Is it a result of pricing rules?
  - Is it a result of monetary policy rules?
- Basic sticky price model (Calvo) has zero inflation persistence from the pricing rules
- Many current DSGE models therefore augment the basic model with “dynamic indexation”: firms that adjust, but just do so on the basis of past inflation [Christiano, Eichenbaum, Evans; Smets- Wouters; Dennis (FRB SF)]

# Discipline: inflation persistence

$$\pi_t = b \pi_{t-1} + f E_t \pi_{t+1} + \lambda \psi_t$$

$$b(\theta, \omega, \beta) = \frac{\omega(1-\theta)}{\theta + \omega(1-\theta)(1+\beta)}$$

$\theta$  = prob of inaction,  $\omega$  = prob index, given action

Calvo:  $\omega = 0 \Rightarrow b = 0$

Full indexation:  $\theta = 0 \Rightarrow b = \frac{1}{1+\beta} \approx \frac{1}{2}$

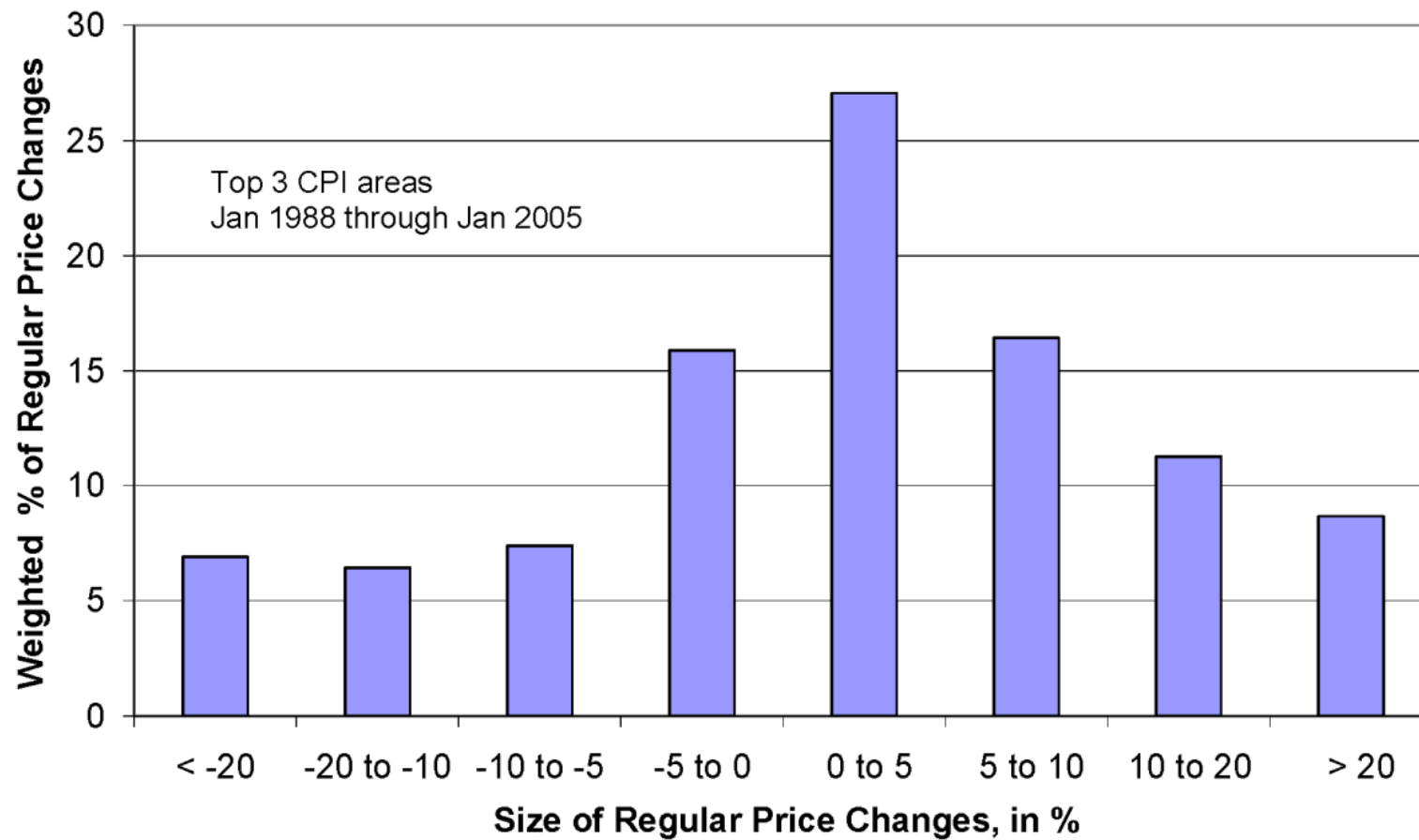
Dennis estimates:  $\theta=.4, \omega=.95 \Rightarrow b=.37$

Lots of adjustment (60%), indexation (95%)

# Price changes

(source Klenow and Kryvstov, 2007)

**Figure 2**  
Weighted Distribution of Regular Price Changes

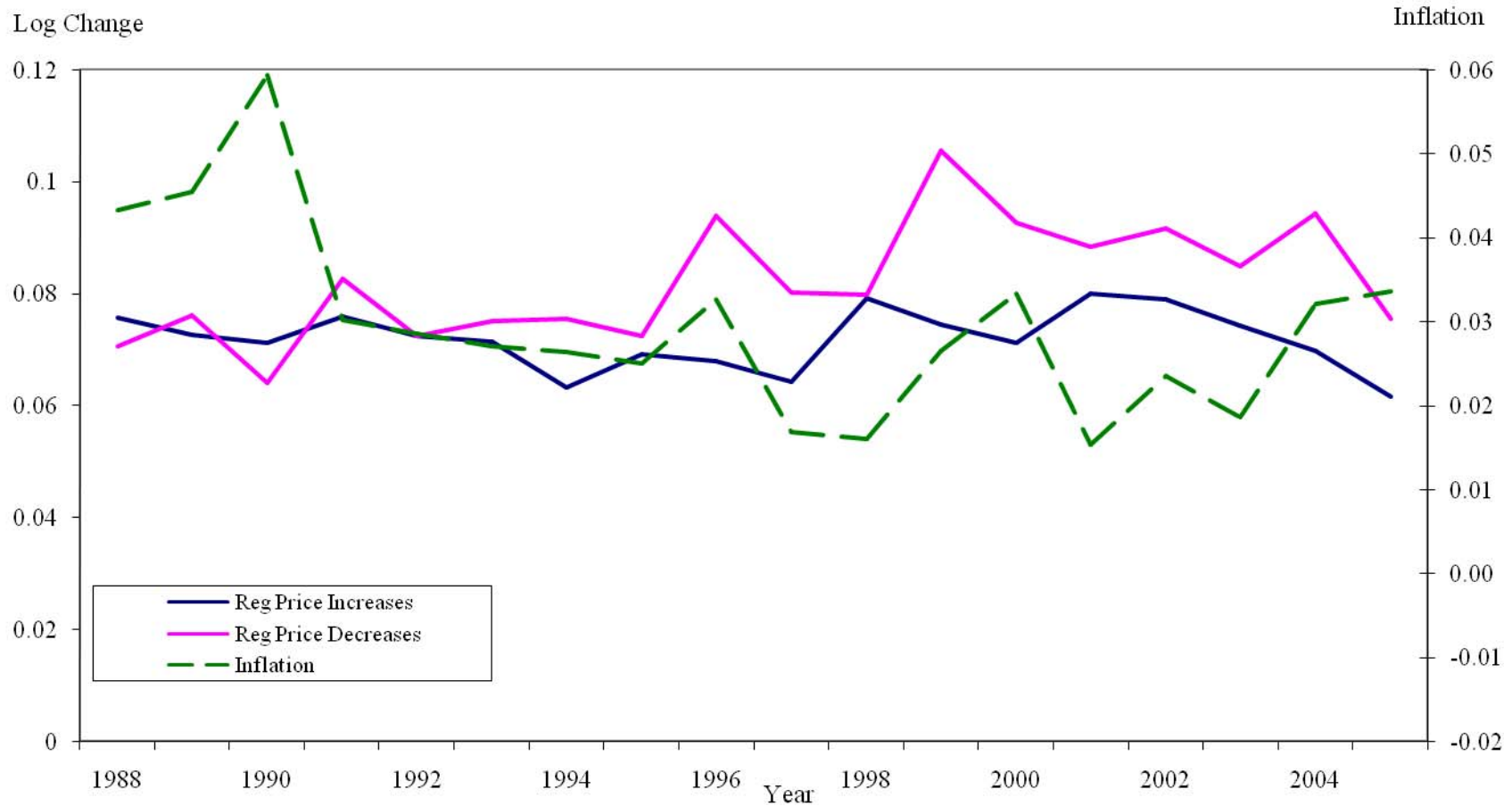


# 3. The Challenges

- Extreme choice
  - **Standard model:** Endogenous price change size, exogenous timing (Calvo and relatives)
  - **Polar opposite:** Endogenous adjustment timing, exogenous price size
- Which one
  - should be the reference sticky price model in a first year class?
  - should be the basis for building parsimonious DSGE models?

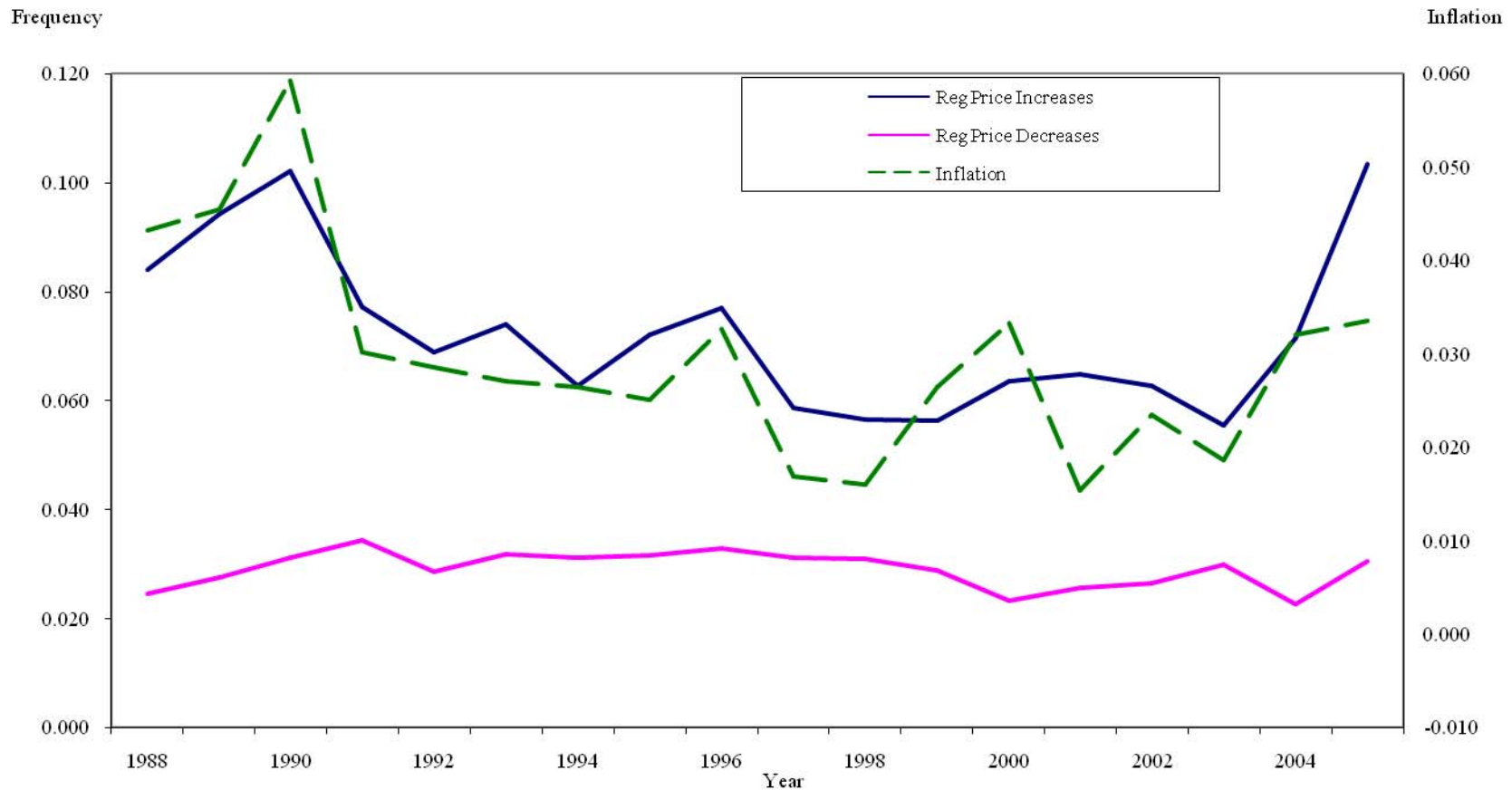
# Average size of price changes (increases, decreases)

Source: Nakamura and Steinsson, 2008



# Price adjustment and inflation

(source: Nakamura and Steinsson, 2008)



# Summary comments

- New micro data will
  - Place substantial discipline on macro models
  - Provide new challenges for modeling
- Dynamic indexation as a source of inflation persistence is one example: it dramatically runs afoul of the micro data
- NS description of US CPI suggests that we've got the basic model wrong (related KK statistics suggest otherwise)
- More measurement is needed