Econ 314

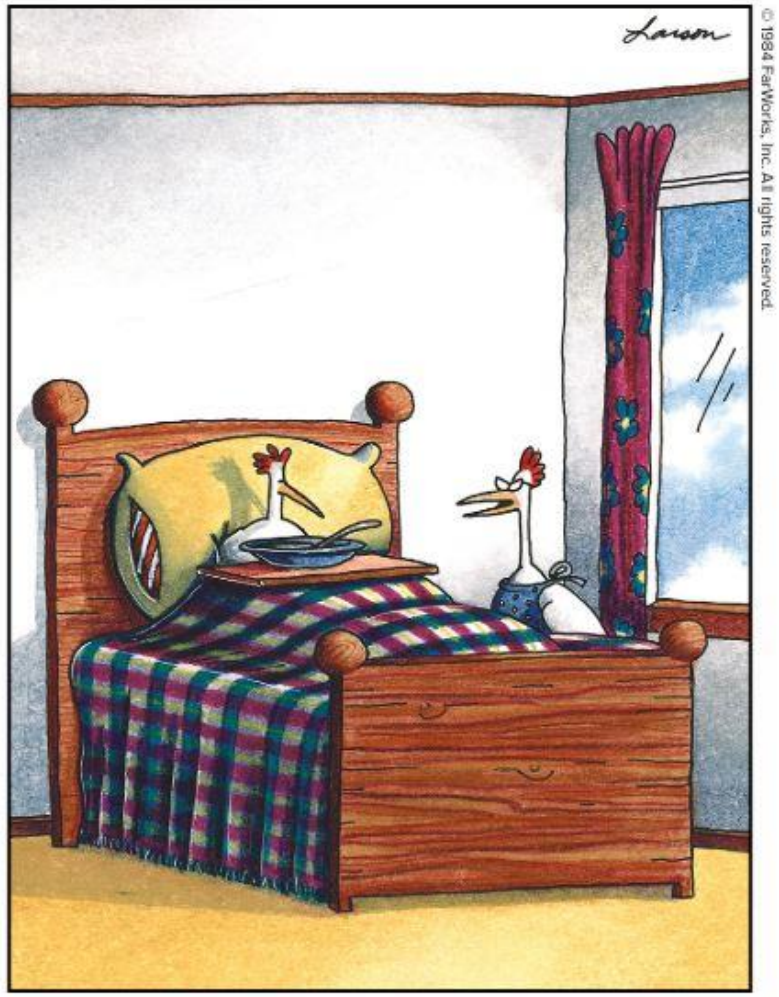
Monday, April 13

Models with Inflation Inertia

Reading: Romer, Sections 7.6 - 7.8

Class notes: 131 - 134

Today's Far Side offering



"Quit complaining and eat it! ... Number one, chicken soup is good for the flu, and number two, it's nobody we know."

A good reason not to eat chickens!

Context and overview

- The Taylor and Calvo models cannot explain why prices would continue to increase for a time after AD stops growing
- But **inflation inertia** seems to occur in the data, as we discussed when talking about the modern Phillips curve (Ball's paper on sacrifice ratio)
- New Keynesian Phillips curve is strictly **forward-looking**; a **backward-looking** model is better at explaining inflation inertia
- **Christiano, Eichenbaum, and Evans** developed a hybrid forward- and backward-looking model that fits data better
- **Mankiw and Reis** presented a model with "sticky information" that also fits well and has plausible microfoundations

Inflation inertia

- Suppose that the economy has been in an equilibrium with 5% inflation, but suddenly growth of m drops to zero
  - (Assume that y has no trend)
- New steady-state inflation rate will be zero
- Firms' price-adjustment choice is now trivial in the model of price rigidities: Both p^* and p_0 are the existing level of p
  - Firm keeps price constant and does not change output
  - Actual inflation adjusts to 0 immediately with no recession
- Conflicts with Ball's evidence on the costs of disinflation that suggests that y usually falls with unexpected fall in m growth

Backward-looking vs. forward-looking

- New Keynesian Phillips curve is **forward-looking**

$$\pi_t = E_t \pi_{t+1} + \kappa\left(y_t - \bar{y}_t\right)$$

  - Rational agents will adjust expectations for next period inflation and not increase prices this period
  - No change in output

- **Backward-looking** Phillips curve might predict effect on y

$$\pi_t = E_{t-1} \pi_t + \kappa\left(y_t - \bar{y}_t\right)$$

  - Even if agents learn fully about change in t, that is too late to change last period's expectations
  - y falls when inflation is lower than previous expectations

Christiano, Eichenbaum, and Evans (CEE)

- Firms that don't "change prices" raise them at the **previous rate of inflation** (keeping π constant rather than keeping p constant)
  - Choice is between π_0 and π^* rather than p_0 and p^*
  - Fits well with model where costs of adjustment are decision costs vs. physical menu costs: keeping inflating at old rate unless change decision
- Basic pricing equation
  - Calvo: $p_t = (1-\alpha)p_{t-1} + \alpha x_t$
  - CEE: $p_t = (1-\alpha)(p_{t-1} + \pi_{t-1}) + \alpha x_t$
- After some algebra (Romer, pp. 345 – 346)

$$\pi_t = \gamma\pi_{t-1} + (1-\gamma)E_t\pi_{t+1} + \chi y_t \text{ with } \gamma = \frac{\beta}{1+\beta} \approx \tfrac{1}{2}$$

Implications of CEE model

$$\pi_t = \gamma\pi_{t-1} + (1-\gamma)E_t\pi_{t+1} + \chi y_t$$

- **Lagged effects** through the automatic price increases by the firms that do not adjust pricing strategies
- **Forward-looking effects** through anticipatory price-setting by the first that do adjust strategies
- Model explains **inflation inertia** because even change in AD that is immediately and credibly announced would only affect the part of firms that *do* change strategies and not those who don't
- Is this an optimal pricing policy for firms?

Mankiw and Reis: Sticky information

- **Slow receipt of information** delays changing of pricing strategies
- Firms set **desired price path** for current and future prices based on available information
  - Keep going forward with the same strategy until new information comes
- In each period, a **fraction α of firms gets new information**
  - Random selection of which firms get info
- Remaining **(1 – α) share keep previous pricing plan** in place

Solution of Mankiw-Reis model

$$p_t = \sum_{i=0}^{\infty} a_i \left(E_{t-i} m_t - E_{t-i-1} m_t \right)$$

$$y_t = \sum_{i=0}^{\infty} \left(1 - a_i\right) \left(E_{t-i} m_t - E_{t-i-1} m_t \right)$$

- Terms on right are new pieces of information about today's m_t that arrive between $t-i-1$ and $t-i$
- Both p and y depend on cumulation of all of these past innovations to m
- Effect of all m is divided between p and y
  - Must be so because $m = p + y$
  - Fraction a_i is effect of info i periods old on p, $1 - a_i$ is effect on y

What is *a*?

$$a_i = \frac{\phi\left[1-(1-\alpha)^{i+1}\right]}{1-(1-\phi)\left[1-(1-\alpha)^{i+1}\right]}$$

- Romer derives this with lots of algebra
- ϕ is our old friend from the optimal pricing equation
- α is probability of changing pricing strategies

- Next three slides have effects of three changes in AD path on y and π in three models: Sticky prices (Taylor/Calvo), backward looking (naïve Phillips curve), sticky information

One-time fall in *m* (with no ongoing growth)

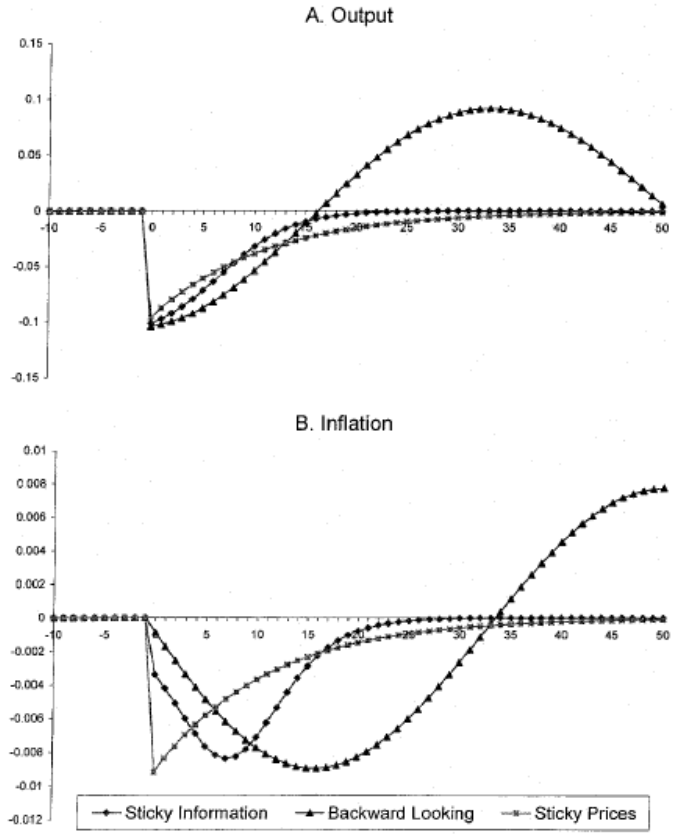


FIGURE I
Dynamic Paths after a 10 Percent Fall in the Level of Aggregate Demand at Time 0

- All 3 models predict recession and recovery
- Backward-looking model predicts boom and inflation later
- Both sticky-info and sticky-price models seem realistic

Unexpected reduction in growth of *m*

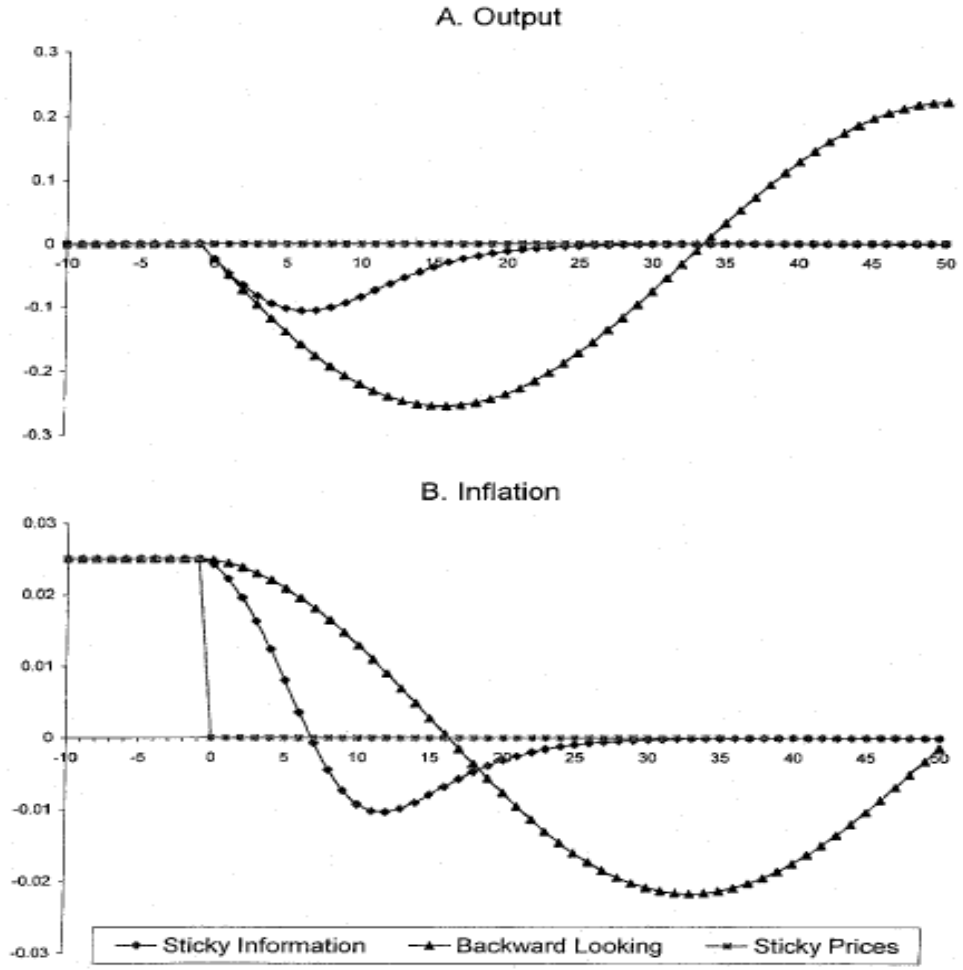


FIGURE II
Dynamic Paths Given an Unanticipated Fall in the Growth Rate of Aggregate Demand at Date 0

- No recession in sticky-price model with immediate drop to zero inflation
  - No inflation inertia
- Still have rebound boom in backward-looking model
- Sticky-info model seems quite realistic: recession and recovery with gradual decline in inflation

Pre-announced reduction in growth of *m*

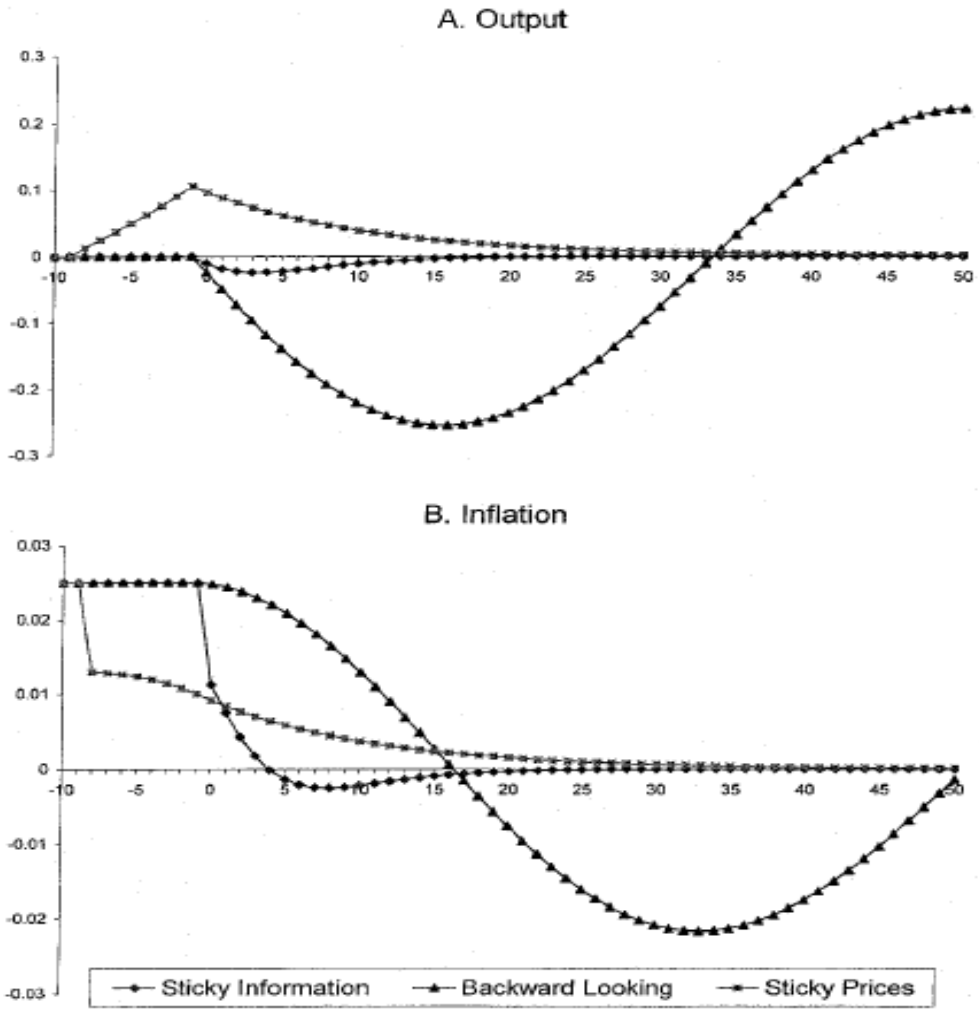


FIGURE III
Dynamic Paths Given an Announcement at Date −8 of a Fall in the Growth Rate of Aggregate Demand at Date 0

- Anticipatory output boom and no recession in sticky-price model
  - Firms start lowering π now, so before Δm changes y must rise
- Backward-looking firms don't adjust at all at announcement
- Sticky-price firms adjust π quickly after actual change with small recession

New Keynesian DSGE models

- Most macroeconomic analysis since 2000 has been implementation of new Keynesian dynamic, stochastic, general-equilibrium models in Dynare (or equivalent)
- Three core equations in model
  - **New Keynesian *IS* curve**, sometimes including models of consumption and investment
  - **New Keynesian Phillips curve**, sometimes with inflation inertia built in through CEE or Mankiw-Reis model
  - **Monetary-policy function** for interest rates such as *MP* curve
- These three equations determine **three core endogenous variables**: Y, r, and π
- Hundreds of variations at http://www.macromodelbase.com/

Review and summary

- **Inflation inertia** seems to happen but is inconsistent with simple price-stickiness models of Taylor and Calvo
- **Christiano, Eichenbaum, and Evans** assume that non-resetting firms keep inflation constant rather than prices constant
- **Mankiw and Reis** model effects of sticky information on price setting
- Both of these models predict inflation inertia
- **New Keynesian DSGE models** have proliferated massively in recent years

Bad economist joke of the day

A woman hears from her doctor that she only has half a year to live. The doctor advises her to marry an economist.

The woman asks, “Will this cure my illness?”

“No,” the doctor answers, “but the six months will seem like a lifetime!”

--Taken from Jeff Thredgold, *On the One Hand: The Economist's Joke Book.*

What's next?

- This session concludes our analysis of formal macro models
- We next turn to models of individual parts of the macroeconomy, starting with the determination of the **natural rate of unemployment**
- On Wednesday (April 15), we introduce some basic concepts about unemployment and consider a generic **efficiency-wage model**
- On Friday (April 17), we begin our analysis of the **Shapiro-Stiglitz model**, a dynamically complex but analytically rich application of the efficiency-wage idea