Rationally Confused: On the Effects of Information Provision Policies

Miguel Acosta
Columbia University

Hassan Afrouzi
Columbia University

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Outline

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- But what is an exogenous shock to beliefs anyway?
  - In models with full information, all information about present and past is endogenous.
  - So giving information about history is irrelevant.
- That's not true!

Exogenous Expectation Shocks

- Coibion et al. (2018a) and Coibion et al. (2018b):
  - RCTs in New Zeland and Italy.
- Main idea:
  1. Survey a group of firms.
  2. Treat a random sample with information about current inflation.
  3. Follow up later and see if they behaved differently than the control group.

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- **Result #2:** In different directions...

Expectation Changes and Firm Decisions

In response to an exogenous increase in a firm's inflation expectations, a firm

- in Italy (Coibion et al., 2018b)
  - raises prices slightly
  - reduces employment substantially
- in New Zealand (Coibion et al., 2018a)
  - raises prices slightly
  - increases employment substantially

Implication: communications that raise inflation expectations are *contractionary* in Italy and *expansionary* in New Zealand.

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- **This paper:** a model of firm decision making with rational inattention under supply and demand shocks.
- We show firms in such an environment choose information sets that do not permit perfect identification of supply and demand.
- When a firm's inflation expectation is raised exogenously:
  - in a supply-driven economy, the firm attributes the higher inflation to a negative supply shock and reduces employment
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Structural DSGE and VAR evidence suggests that supply shocks are dominant in Italy, and demand shocks are dominant in New Zealand [Kamber et al. (2016), Albonico et al. (2019)].

Outline

Firms: Setup

- Monopolistically competitive atoms
- Production linear in labor
- Rationally inattentive: information is costly where the cost of every bit of information is ψ
- Two decisions required in maximizing profits
  - choice of information structure (i.e., signals s_t)
  - choice of prices as a function of information

Environment

Fluctuations are driven by

- demand shocks: $Q_t \equiv P_t Y_t$
  fully-attentive optimizing households and a monetary authority
- supply shocks: Z_t
  $Y_{i,t} = Z_t N_{i,t}$

The logs of these shocks, (z_t, q_t) are Brownian motions.
A firm's optimal price p_t^* and output y_t^* are functions of fundamental shocks.

$$p_t^* = q_t - z_t$$
$$y_t^* = q_t + z_t$$

Firms: Formal Problem

A second-order approximation to the above problem is

$$\min_{\{p_{i,t}(S_{i,t}),n_{i,t}(S_{i,t})\}_{t=0}^{\infty}} \int_0^{\infty} e^{-\rho t}\, \mathbb{E}\left[(p_{i,t}-p_t^*)^2+\alpha(y_{i,t}-y_t^*)^2+C(S_{i,t}) \mid S_{i,0}\right] dt$$

$$C(S_{i,t}) \equiv \psi \left[\lim_{dt\to 0} \frac{h\left(\begin{bmatrix} q_t \\ z_t \end{bmatrix} \middle| S_{i,t-dt}\right) - h\left(\begin{bmatrix} q_t \\ z_t \end{bmatrix} \middle| S_{i,t}\right)}{dt} \right]$$

$$S_{i,t} \equiv \{s_{i,\tau}, \tau \leq t\}\,;\ \text{given } S_{i,0}$$

with

- $s_{i,t}$ firm's signal at time t
- h conditional entropy
- p_t^*, y_t^* full information prices and output

Firms: Solution

Conditional on its information set, a firm sets its price and employment equal to expected full-information levels.

Proposition

The firm's optimal information structure consists of signals about its optimal price and optimal employment:

$$s^p_{i,t} = p^*_t + \varepsilon^p_{i,t} \qquad \varepsilon^p_{i,t} \sim \mathcal{N}(0, \sigma^2_p)$$
$$s^n_{i,t} = y^*_t + \varepsilon^y_{i,t} \qquad \varepsilon^y_{i,t} \sim \mathcal{N}(0, \sigma^2_y).$$

The variances are chosen in order to minimize posterior uncertainty given the cost of processing information.

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An Experiment in the Model

What are firms' responses to an exogenous shift in inflation expectations?

$$y_{i,t+k} = \alpha_k + \phi_k \, \mathbb{E}_{i,t}[\pi_t] + \varepsilon_{i,t,k} \, .$$

Note that expectations are endogenous – need an IV.

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$$y_{i,t+k} = \alpha_k + \phi_k \, \mathbb{E}_{i,t}[\pi_t] + \varepsilon_{i,t,k} \, .$$

Note that expectations are endogenous – need an IV. We run the same experiment in the model:

- Let firms form their beliefs under optimal information acquisition.
- Select a sample and give a one time signals about inflation.
- Track their decisions over time relative to control group.

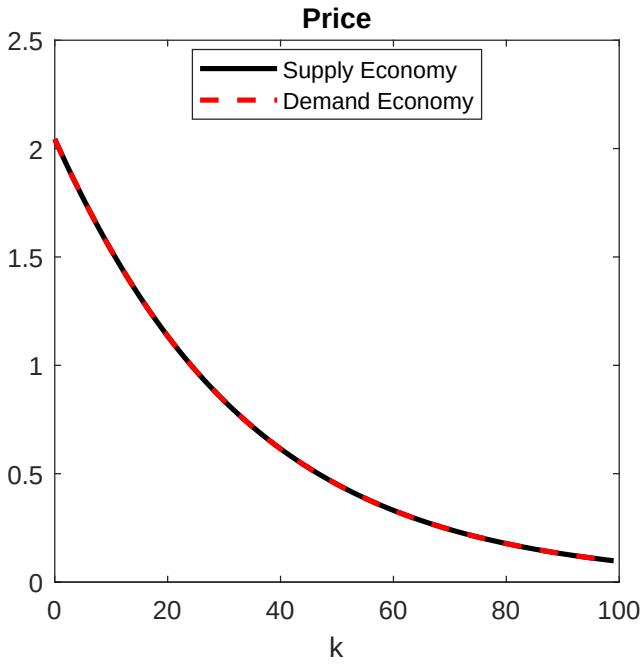
A subset of treated firms $i \in \mathcal{T}$ receive a signal about inflation $s^{\pi}_{i,t} = \pi_t + \varepsilon^{\pi}_{i,t}$. We instrument for $\mathbb{E}_{i,t}\, \pi_t$:

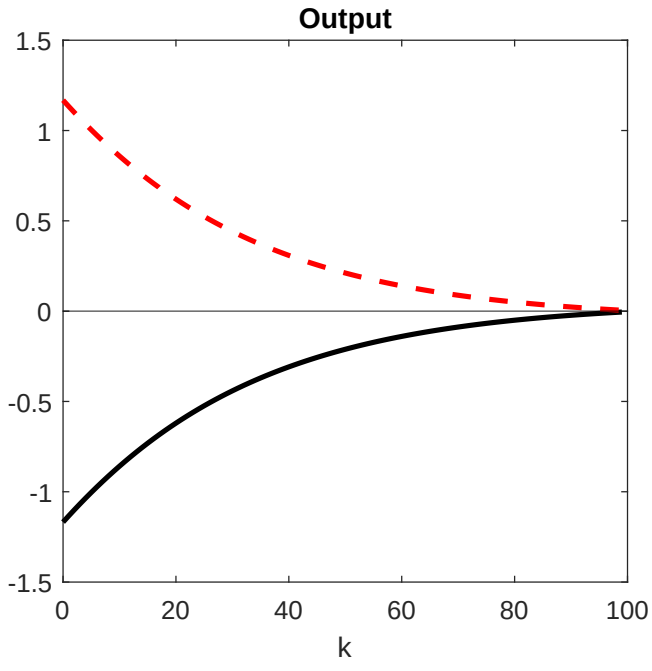
$$\mathbb{E}_{i,t}[\pi_t] = a + b \left(\mathbb{1}\{i \in \mathcal{T}\} \times s^{\pi}_{i,t} \right) + e_{i,t}$$

and study results for two economies

- a *supply economy* (primarily driven by supply shocks)
- a *demand economy* (primarily driven by demand shocks)

Responses of Output and Prices





Observations and Comparative Statics

Responses depend critically on

- Relative variance of supply vs. demand shocks
  - Supply shocks more important $\Rightarrow$ in response to positive inflation news, firms adjust employment as if a negative supply shock hit (fire)
- Relative importance of employment objective relative to information processing parameter
  - when two decisions are relatively equally important (high weight), firms are well-informed about supply and demand shocks because signals are more informative for identification.

Outline

Plans for Future Work

- Realistic model calibration
- Study *aggregate* effects of the communications that affect economic expectations

End. Thanks!

References I

Coibion, Olivier, Yuriy Gorodnichenko, and Saten Kumar, "How Do Firms Form Their Expectations? New Survey Evidence," *American Economic Review*, 2018, *108*, 2671–2713.

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