Macroeconomics 2 Presentation

Article review :
Gabaix, Xavier. 2020. "A Behavioral New Keynesian Model." American Economic Review, 110(8): 2271-2327

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April 28, 2024

Sciences Po

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Household's Problem

$$U = \mathbb{E}\left[\sum_{t=0}^{\infty} \beta^t u(c_t, N_t)\right] \tag{1}$$

With

$$u(c_t, N_t) = \frac{c^{1-\gamma} - 1}{1-\gamma} - \frac{N^{1+\phi}}{1+\phi}$$

So we have the following objective function of the houshold :

$$U = \mathbb{E}\left[\sum_{t=0}^{\infty} \beta^t \left(\frac{c^{1-\gamma} - 1}{1-\gamma} - \frac{N^{1+\phi}}{1+\phi}\right)\right]$$

Household's Problem

$$k_{t+1} = (1 + r_t)(k_t - c_t + y_t) \tag{2}$$

Consequences

3. Consequences

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Behavioral Enrichments of the Model

6. Behavioral Enrichments of the Model

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Term Structure of Consumer Attention

It is plausible that consumers do not pay attention equally to all economic variables, even in the present. We could therefore introduce attention discount factors that are variable specific. Those attention discount factors would then yield perceived variables under Bounded Rationality :

- $\hat{r}^{BR}$ the perceived interest rate under bounded rationality
- $\hat{y}^{BR}$ the perceived income under bounded rationality

Prior to this, consumers perceived perfectly variables at the current period, now, they do not anymore.

Term Structure of Consumer Attention

The law of motion of the personal wealth of the consumer becomes thus a **perceived law of motion**

$$\begin{aligned} k_{t+1} &= G^k(c_t, N_t, k_t, \boldsymbol{X}_t) \\ &:= (1 + \bar{r} + \hat{r}(\boldsymbol{X}_t))(k_t + \bar{y} + \hat{y}(N_t, \boldsymbol{X}t) - c_t) \end{aligned} \tag{6}$$

Turns into :

$$\begin{aligned} k_{t+1} &= \mathbf{G}^{k,BR}(c_t, N_t, k_t, \mathbf{X}_t) \\ &:= (1 + \bar{r} + \hat{r}^{BR}(\mathbf{X}_t))(k_t + \bar{y} + \hat{y}^{BR}(N_t, \mathbf{X}_t) - c_t) \end{aligned} \tag{49}$$

The perceived values of interest rate and income are defined such that :

$$\begin{cases} \hat{r}^{BR} = m_r \cdot \hat{r}(\mathbf{X}_t) \\ \hat{y}^{BR}(N_t, \mathbf{X}_t) = m_y \cdot \hat{y}(\mathbf{X}_t) + \omega(\mathbf{X}_t)(N_t - N_t(\mathbf{X}_t)) \end{cases} \tag{50}$$

Now, consumers are already behavioral, i.e. they have a general attention discount factor, from Lemma 1 in equation (11) :

$$\mathbb{E}_t^{BR}\left[z\left(\boldsymbol{X}_{t+k}\right)\right] = \bar{m}^k \cdot \mathbb{E}_t\left[z\left(\boldsymbol{X}_{t+k}\right)\right] \tag{11}$$

Applied to the perceived interest rate and perceived income, we thus get the **Lemma 5 (Term Structure of Attention)**:

$$\begin{cases} \mathbb{E}_t^{BR}\left[\hat{r}^{BR}(\mathbf{X}_{t+k})\right] = m_r \cdot \bar{m}^k \cdot \mathbb{E}_t\left[\hat{r}(\mathbf{X}_{t+k})\right] \\ \mathbb{E}_t^{BR}\left[\hat{y}^{BR}(\mathbf{X}_{t+k})\right] = m_y \cdot \bar{m}^k \cdot \mathbb{E}_t\left[\hat{y}(\mathbf{X}_{t+k})\right] \end{cases} \tag{51}$$

What are consequences of this enriched attention structure term ?

When we solve for consumption[1], we get **Proposition 8 (Behavioral Consumption Function)** :

$$\hat{c}_t = \mathbb{E}_t \left[\sum_{\tau \geq t} \frac{\bar{m}^{\tau-t}}{R^{\tau-t}} \left(b_r m_r \hat{r}(\mathbf{X}_\tau) + m_Y \frac{\bar{r}}{R} \hat{y}(\mathbf{X}_\tau) \right) \right] \tag{52}$$

With :

$$\begin{cases} c_t = c_t^d + \hat{c}_t \\ c_t^d = \bar{y} + b_k \cdot k_t \\ b_k := \frac{\bar{r}}{R} \cdot \frac{\phi}{\phi+\gamma} \end{cases} \qquad \begin{cases} m_Y = \frac{\phi \cdot m_y + \gamma}{\phi+\gamma} \\ b_r := -\frac{1}{\gamma \cdot R^2} \end{cases}$$

[1] For more details on the derivation, check the equations decription file.

Term Structure of Consumer Attention

Interest rate has **direct** and **indirect** effects on consumption.
For a consumer, a decrease in future interest rate :

- increases their present consumption, because it is more profitable to consume right now (direct effect)
- increases other consumers future consumption, increasing their future income, increasing their current consumption (indirect effect)

Therefore, the aggregate consumption multiplies the positive effect on consumption of a decrease in future interest rate.
What does this behavioral model imply for this multiplicator ?

Term Structure of Consumer Attention

In the **rational consumer** case :

If we derive from equation (52), we get the direct effect :

$$\Delta^{\text{direct}} := \left.\frac{\partial \hat{c}_0}{\partial \hat{r}_\tau}\right|_{(y_t)_{t\geq 0} \text{ held constant}} = -\alpha \cdot \frac{1}{R^\tau}$$

If we derive from equation (26), we get the indirect effect :

$$\Delta^{GE} := \frac{\partial \hat{c}_0}{\partial \hat{r}_\tau} = -\alpha R$$

Put together :

$$\frac{\Delta^{GE}}{\Delta^{\text{direct}}} = R^{\tau+1} \tag{53}$$

Term Structure of Consumer Attention

In the **behavioral consumer** case :

If we derive from equation (52), we get the direct effect :

$$\Delta^{\text{direct}} := \left.\frac{\partial \hat{c}_0}{\partial \hat{r}_\tau}\right|_{(y_t)_{t\geq 0} \text{ held constant}} = -\alpha \cdot m_r \cdot \bar{m}^\tau \frac{1}{R^\tau}$$

If we derive from equation (26), we get the indirect effect :

$$\Delta^{GE} := \frac{\partial \hat{c}_0}{\partial \hat{r}_\tau} = -\alpha m_r \cdot M^\tau \frac{R}{R - r \cdot m_Y} R$$

Put together :

$$\frac{\Delta^{GE}}{\Delta^{\text{direct}}} = \left(\frac{R}{R - r m_Y}\right)^{\tau+1} \in \left[1, R^{\tau+1}\right] \tag{54}$$

Term Structure of Consumer Attention

In a behavioral framework, the multiplicative effect is dampened by bounded rationality.

An attention discount factor that is variable specific allows to explain why the Keynesian multiplicator is not as strong as what theory predicts.

What about variable specific attention deficiency for firms now ?

Flattening of the Phillips Curve via Imperfect Firm Attention

If we introduce variable specific inattention for firms, equation (15), defining the real profit of the firm :

$$v\left(q_{it}, \boldsymbol{X}\tau\right) := v^{0}\left(q_{it} - \Pi(\boldsymbol{X}\tau), \mu(\boldsymbol{X}\tau), c(\boldsymbol{X}_{\tau})\right) \tag{15}$$

turns into a perceived real profit of the firm :

$$v^{BR}(q_{it}, (\mathbf{X}_{\tau})) := v^{0}\left(q_{it} - m_{\pi}^{f} \cdot \Pi(\mathbf{X}_{\tau}), m_{x}^{f} \cdot \mu(\mathbf{X}_{\tau}), c(\mathbf{X}_{\tau})\right) \tag{55}$$

Where :

- m_{π}^{f} is the attention deficit to inflation
- m_{x}^{f} is the attention deficit to marginal cost

Flattening of the Phillips Curve via Imperfect Firm Attention

The maximisation program of equation (16) :

$$\max_{q_{it}} \mathbb{E}_t \left[\sum_{\tau=t}^{\infty} (\beta\theta)^{\tau-t} \frac{c\left(\boldsymbol{X_\tau}\right)^{-\gamma}}{\left(\boldsymbol{X_t}\right)^{-\gamma}} v\left(q_{it}, \boldsymbol{X}\tau\right) \right] \tag{16}$$

turns into :

$$\max_{q_{it}} \mathbb{E}_t^{BR} \left[\sum_{\tau=t}^{\infty} (\beta\theta)^{\tau-t} \frac{c(\mathbf{X}_\tau)^{-\gamma}}{c(\mathbf{X}_t)^{-\gamma}} v^{BR}(q_{it}, \mathbf{X}_\tau) \right] \tag{56}$$

Flattening of the Phillips Curve via Imperfect Firm Attention

Solving it yields :

$$p_t^* = p_t + (1-\beta\theta) \cdot \sum_{k=0}^{\infty} (\beta\theta\bar{m})^k \, \mathbb{E}_t \left[m_\pi^f (\pi_{t+1} + ... + \pi_{t+k}) - m_x^f \mu_{t+k} \right] \tag{57}$$

Flattening of the Phillips Curve via Imperfect Firm Attention

We also get :

$$M^f = \bar{m}\left(\theta + m_\pi^f \cdot (1-\theta) \cdot \frac{1-\beta\cdot\theta}{1-\beta\cdot\theta\cdot\bar{m}}\right) \in [0,1]$$

$$\kappa = m_x^f \bar{\kappa} \tag{58}$$

Where

- M^f is the general attention factor of the firm
- m_x^f is the attention deficiency to the output gap
- $\kappa = m_x^f \cdot \bar{\kappa}$, is the perceived value of the importance of outputgap on inflation

Flattening of the Phillips Curve via Imperfect Firm Attention

If we solve the Phillips curve, the equation (29) :

$$\pi_t = \beta \cdot M^f \cdot \mathbb{E}t\left[\pi_{t+1}\right] + \kappa \cdot x_t \tag{29}$$

turns into : **Proposition 10 (Phillips Curve with Behavioral Firms, Allowing for Imperfect Attention to Inflation and Costs)** :

$$\pi_t = \beta \cdot \bar{m}\left(\theta + m_\pi^f \cdot (1-\theta) \cdot \frac{1-\beta \cdot \theta}{1-\beta \cdot \theta \cdot \bar{m}}\right) \cdot \mathbb{E}t\left[\pi_{t+1}\right] + m_x^f \cdot \bar{\kappa} \cdot x_t$$

Nonconstant Trend Inflation and Neo- Fisherian Paradoxes

$$\pi_t^d = (1-\zeta)\bar{\pi}_t + \zeta\bar{\pi}_t^{CB} \tag{59}$$

$$x_t = M\mathbb{E}_t\left[x_{t+1}\right] - \sigma\left(i_t - \mathbb{E}_t\left[\pi_{t+1}\right] - r_t^n\right) \tag{60}$$

$$\pi_t = \beta \cdot M^f\mathbb{E}_t\left[\hat{\pi}_{t+1}\right] + \kappa \cdot x_t \tag{61}$$

$$\phi_\pi + \zeta\frac{(1-\beta M^f)}{\kappa}\phi_x + \zeta\frac{(1-\beta M^f)(1-M)}{\kappa\sigma} > 1 \tag{62}$$

Discussion of the Behavioral Assumptions

- Theoretical Microfoundation
- Lucas Critique
- Long-Run Learning
- Parsimony and New Degrees of Freedom
- Reasonable Variants

Conclusion

1. Contextualization
2. Baseline model of the paper
3. Consequences
4. Implications for monetary policy
5. Implications for fiscal policy
6. Behavioral Enrichments of the Model
7. Discussion of the Behavioral Assumptions
8. Conclusion
9. Limits and Critics

8. Conclusion

Limits and Critics

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