Discussion of "Implications of Endogenous Cognitive Discounting"

by James Moberly

Sahil Ravgotra

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What the paper does

Consider a standard NK model with agents paying endogenous attention M_c, M_f to the future, à la Gabaix (2014, 2016, 2020)

$$x_t = M_c(\chi, \xi)\mathbb{E}_t x_{t+1} - \sigma(i_t - \mathbb{E}_t \pi_{t+1}) \tag{1}$$

$$\pi_t = \beta M_f(\chi, \xi)\mathbb{E}_t \pi_{t+1} + \kappa x_t \tag{2}$$

$$i_t = \rho_i i_{t-1} + (1 - \rho_i)(\phi_\pi \pi_t + \phi_x x_t) \tag{3}$$

where $M_c, M_f < 1$.

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- Implications of endogenous attention
  - $\longrightarrow$ an indeterminate equilibrium always exists whenever the RE Taylor principle is violated;
  - $\longrightarrow$ a stronger policy reaction to inflation has larger effects on inflation volatility when shocks are larger;
  - $\longrightarrow$ resolves a weak identification problem.

Foundations matter: BR Expectations

Endogenous discounting in the paper:

- An *equilibrium choice of attention* is a choice of attention $M_c(\chi, \xi)$ such that:

$$M_c(\chi, \xi) = g_c(M_c(\chi, \xi), \chi, \xi_c) \tag{4}$$

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Exogenous discounting in Gabaix (2020):

- Gabaix's expectation operator

$$\mathbb{E}_t^{BR}[\mathbb{X}_{t+k}] = M^k \mathbb{E}_t[\mathbb{X}_{t+k}] \tag{5}$$

Foundations matter: A word on the Phillips Curve

The paper follows Gabaix (2020) for the derivation of the PC

$$\pi_t = \beta M \left[\theta + (1-\theta) \frac{1-\beta\theta}{1-M\beta\theta} \right] \mathbb{E}_t \pi_{t+1} + \kappa x_t \tag{6}$$

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- If firms are BR, firms resetting their price would choose on average price of:

$$p_t^* = p_t + (1-\beta\theta)\sum_{k=0}^{\infty}(\beta\theta)^k \mathbb{E}_t^{BR}[\pi_{t+1} + \ldots + \pi_{t+k} - \mu_{t+k}] \tag{7}$$

- The paper and Gabaix (2020) applies cognitive discounting, so that

$$p_t^* = p_t + (1-\beta\theta)\sum_{k=0}^{\infty}(M\beta\theta)^k \mathbb{E}_t[\pi_{t+1} + \ldots + \pi_{t+k} - \mu_{t+k}] \tag{8}$$

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- Gabaix (2020) implicitly applies myopia to nominal rather than real marginal cost, even though the former is not constant in the steady state.

Foundations matter: A word on the Phillips Curve

- The transition from subjective to objective expectations

$$p_t^* = p_t + (1 - \beta\theta) \sum_{k=0}^{\infty} (\beta\theta)^k \mathbb{E}_t [M\pi_{t+1} + ... + M^k \pi_{t+k} - M^k \mu_{t+k}] \qquad (9)$$

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- So, the coefficient of $\mathbb{E}_t \pi$ is βM:

$$\pi_t = \beta M \mathbb{E}_t \pi_{t+1} + \kappa x_t \qquad (10)$$

- See Benchimol and Bounader (2019) and Kolasa, Ravgotra and Zabczyk (2022).

Foundations matter: HH's perception of r

- If r is correctly perceived as in the paper and Gabaix (2020):

$$x_t = M\mathbb{E}_t x_{t+1} - \sigma(i_t - \mathbb{E}_t \pi_{t+1}) \tag{11}$$

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- If not: money illusion is assumed

$$x_t = M\mathbb{E}_t x_{t+1} - \sigma(i_t - M\mathbb{E}_t \pi_{t+1}) \tag{12}$$

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- **Comparison with alternative behavioral models**:

  $\longrightarrow$ Gabaix (2020) vs Woodford (2019): see Gust, Herbst, and Lopez-Salido (2021)

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Future Research:

$\longrightarrow$ Macroeconomic consequences of fiscal austerity in terms of government spending cuts and tax increase (see Lustenhouwer and Mavromatis (2021)).

What she does is just putting m in front of every expectations operator in the intertemporal optimality conditions. This happens to result in a correct behavioral IS curve if households hold zero assets, but not otherwise. Following the same logic that we applied to our SOE setup, where households can hold non-zero amount of foreign bonds (or, similarly, Gabaix's extension with public debt), I would expect the IS curve in the Smets-Wouters model to include physical capital, as households hold positive amount of this asset.

References

Benchimol, J., and L. Bounader (2019): "Optimal Monetary Policy Under Bounded Rationality," IMF Working Papers 2019/166, International Monetary Fund.

Gabaix, X. (2014): "A sparsity-based model of bounded rationality," *The Quarterly Journal of Economics*, 129(4), 1661–1710.

——— (2016): "Behavioral macroeconomics via sparse dynamic programming," Discussion paper, National Bureau of Economic Research.

——— (2020): "A Behavioral New Keynesian Model," *American Economic Review*, 110(8), 2271–2327.

Gust, C., E. Herbst, and J. D. Lopez-Salido (2021): "Short-term Planning, Monetary Policy, and Macroeconomic Persistence," *American Economic Journal: Macroeconomics*.

Lustenhouwer, J., and K. Mavromatis (2021): "The Effects of Fiscal Policy when Planning Horizons are Finite," .

Woodford, M. (2019): "Monetary Policy Analysis when Planning Horizons are Finite," *NBER Macroeconomics Annual*, 33(1), 1–50.