Xavier Gabaix (2016): A Behavioral New Keynesian Model

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Overview

Introduction

- Preliminary paper by French economist **Xavier Gabaix** which is likely to have a big impact on macroeconomic research
- Attempts to tackle some of the **puzzling "aggregate outcomes"** of the traditional New Keynesian model
- Addition of a new **parameter "M"** representing myopia of economic agents. Large consequences for monetary and fiscal policy!

What is Myopia?

- General term used for **short-sightedness**
- Economic context: synonymous with **"bounded rationality"**, referring to agents' lack of attention paid to the future
- Most researchers follow a so-called "cult of **perfect rationality**" (Smith 2016)

Five Major Implications

1. **Forward Guidance Puzzle**: In traditional model, agents "unflinchingly respect" their Euler equations, so FG is unrealistically powerful.
   - Gabaix's approach solves this puzzle

2. **Fiscal Policy**: Traditionally Ricardian Equivalence holds in the NK Model, so tax cuts have **no effect** on consumption.
   - If agents are myopic, fiscal policy is much more effective.

Five Major Implications

4. **Zero Lower Bound**: Depressions can be **"unboundedly large"** in the traditional model
   - Gabaix's model seems more in line with empirical data

5. **Equilibrium Selection**: The NK Model offers a continuum of possible equilibria, to be selected from.
   - The Behavioral Model is **deterministic**.

6. **Neo-Fisherian Paradox**: In the traditional NK model a rise in interest rates leads to a smooth rise in **short and long-run** inflation.
   - Gabaix's model is Keynesian in the short-run and Fisherian (money-neutral) in the long run.

Myopia in a 2-Period Model

Agents start with "default" income and experience an additional deviation (e.g. Transfer):

- True income: $y_1 = y_1^d + \hat{y}_1$
- Perceived income with myopia: $y_1^s = y_1^d + \bar{m}\hat{y}_1$
  - $\bar{m} \in [0, 1]$
  - $\hat{y}_1$: Income deviation (e.g. Transfer)

Myopia in a 2-Period Model

- Classic intertemporal consumption decision:

$$C_0 = b(C_0 + \frac{C_1}{R_0})$$

- Myopic consumption with government deficit:

$$C_0 = \frac{b}{1-b}((1 - \bar{m})d_0 + \frac{Y_1}{R_0})$$

- b: Marginal Propensity to Consume
- d_0: Deficit

Myopia in a 2-Period Model

How does aggregate income (consumption) change with a lump-sum transfer?

- $\frac{\delta Y_0}{\delta T_0} = \frac{b}{1-b}(1 - \bar{m})$

And with increased government expenditure?

- $\frac{\delta Y_0}{\delta G_0} = 1 + \frac{b}{1-b}(1 - \bar{m})$

If we think of $\frac{b}{1-b}$ as a "mulitplier", we see a more than one-to-one increase in output due to government spending!

The Behavioral Agent: Rational vs. Behavioral Consumption

- Gabaix's derivation of the IS and Phillips curve starts with the individual consumption function $c_t = c_t^d + \hat{c}_t$
- Income innovation $\hat{c}_t$, as opposed to default consumption c_t^d, is where agent's (ir)rationality comes into play
- There are different myopia parameters: $\bar{m}$ is a general "cognition discounting" parameter, m_r and m_y allow for agents beeing partly inattentive to innovations in r or y (all $\in [0,1]$)

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The Behavioral Agent: Rational vs. Behavioral Consumption

- $\hat{c}_t$ is the agent's *rational* expectation

$$\hat{c}_t = E_t[\sum_{\tau \geq t} \frac{1}{R^{\tau - t}}(b_r(k_r)\hat{r}_\tau + b_y \hat{y}_\tau)] + O(||x||^2)$$

- $b_r(k_t) := \frac{\frac{r}{R}k_t - \frac{1}{\gamma}c^d}{R^2}$ and $b_y := \frac{r}{R}$ are the sensitivities of consumption to an increase in r or y
- With myopic agents, expectation is *subjective* as $\bar{m}$, m_r and $m_y < 1$:

$$\hat{c}_t = E_t^s[\sum_{\tau \geq t} \frac{\bar{m}^{\tau - t}}{R^{\tau - t}}(b_r(k_r) m_r \hat{r}_\tau + b_y m_y \hat{y}_\tau)] + O(||x||^2)$$

The Behavioral IS Curve

- From individual consumption function to aggregate demand: in a New Keynesian world without capital, $\hat{y}_\tau = \hat{c}_\tau$ and $x_\tau = \frac{\hat{y}_\tau}{c^d}$, which gives

$$x_t = E_t[\sum_{\tau \geq t} \frac{\bar{m}^{\tau - t}}{R^{\tau - t}}(b_y m_y x_\tau + \tilde{b_r} \hat{r}_\tau)]$$

- Gabaix uses $M := \frac{\bar{m}}{R - r m_y} \in [0, 1]$ (attention parameter) and $\sigma := \frac{m_r}{\gamma R(R - r m_y)}$ (governs reactions of x_t to changes in $\hat{r}t$)
- After some steps, he arrives at

$$x_t = M E_t[x_{t+1}] - \sigma(\underbrace{i_t - E_t \pi_{t+1} - r_t^n}_{\hat{r}_t})$$

- If agents are perfectly rational and $M = 1$, we have the traditional IS curve

The Behavioral IS curve and Fiscal Policy

- Transfers (T) and government debt (B), but no government consumption: budget deficit is $d_t = T_t + rB_t$
- Iteration gives that *subjective* expectation of T at time τ is

$$E_t^s[T_\tau] = -\frac{r}{R}B_t + m_y \bar{m}^{\tau-t} \underbrace{(d_\tau - r\sum_{u=t}^{\tau-1} d_u)}_{\text{future deficit}}$$

- Partially rational agents anticipate that a given initial debt has to be repaid, but only partly capture future deficits
- The modified IS curve:

$$x_t = b_d d_t + M E_t[x_{t+1}] - \sigma(i_t - E_t\pi_{t+1} - r_t^n)$$

- $b_d = \frac{r m_y}{R - m_y r}\frac{R(1-\bar{m})}{R-\bar{m}}$ is the sensitivity to budget deficits
- Tax cuts do have an impact!

The Behavioral Phillips Curve

- Phillips curve with partially rational firms:

$$\pi_t = \beta M^f E_t[\pi_{t+1}] + \kappa x_t$$

- With $M^f := \bar{m}[\theta + (1-\theta)\frac{1-\beta\theta}{1-\beta\theta\bar{m}} m^f]$ and $\kappa = \bar{\kappa} m^f$, where θ is price stickiness and m^f inattention to future markup innovations
- Firms are more forward-looking (βM^f higher) for higher price stickiness (θ higher)
- Myopia seems to be less of a problems for firms, as they pay more attention to future macro outcomes (m^f), because "they simply have to" (Gabaix 2016, p. 19)

Empirical Evidence

- Galí and Gertler (1999) find, with a $\beta \simeq$ of 0.95, that a $\beta M^f \simeq$ of 0.75 is necessary, which leads to an $M^f \simeq$ of 0.8
- A $\theta = 0.2$ (80% of firms can reset their prices after a year) would then lead to an $m^f = 0.75$
- Johnson et al. (2006) show that tax rebates have a substantial effect on aggregate consumption demand
- Ricardian equivalence doesn't seem to hold empirically, which implies b^d is in fact greater that zero

Behavioral NK Model Synthesis

- The Behavioral IS-Curve:

$$x_t = M E_t[x_{t+1}] - \sigma(i_t - E_t\pi_{t+1} - r_t^n)$$

- The Behavioral Phillips Curve:

$$\pi_t = \beta M^f E_t[\pi_{t+1}] + \kappa x_t$$

The Big Picture

Traditional NK

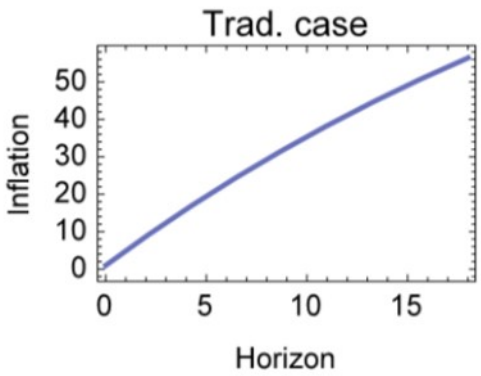
- Announcement of *future* rate change matters today
- "Unboundedly" costly ZLB
- Multiple Equilibria
- Elusive Keynesian short-run deflation

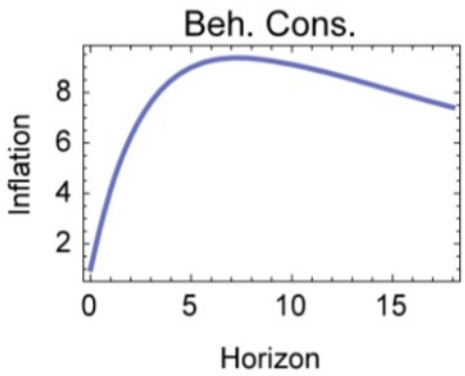
Behavioral NK

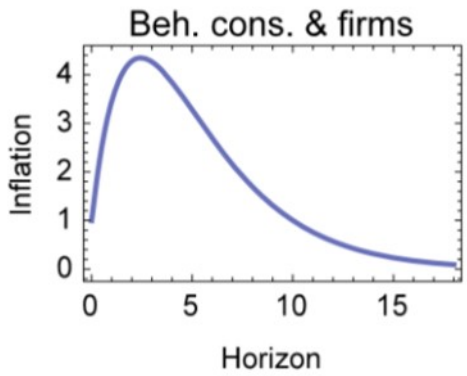
- *Initial* conditions have large impact today
- Less costly ZLB
- Single Equilibrium
- Keynesian short-run, Fisher long-run

Forward Guidance Puzzle

- The further in the future the CB announces rate cut, the less inflation **today** is impacted in Gabaix's model:



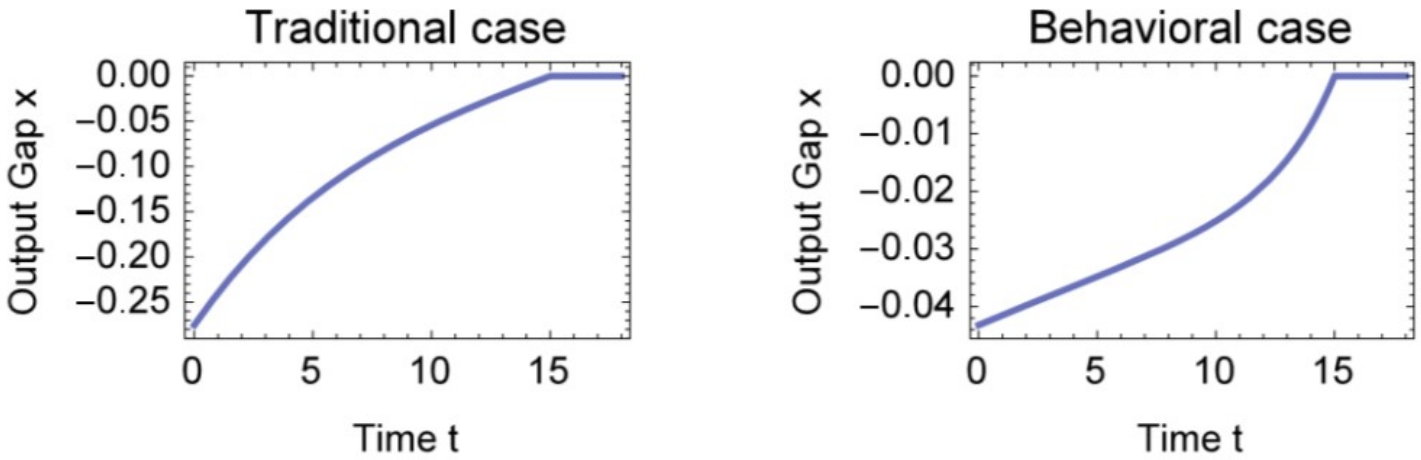




Gabaix (2016), p. 23

Less Costly ZLB

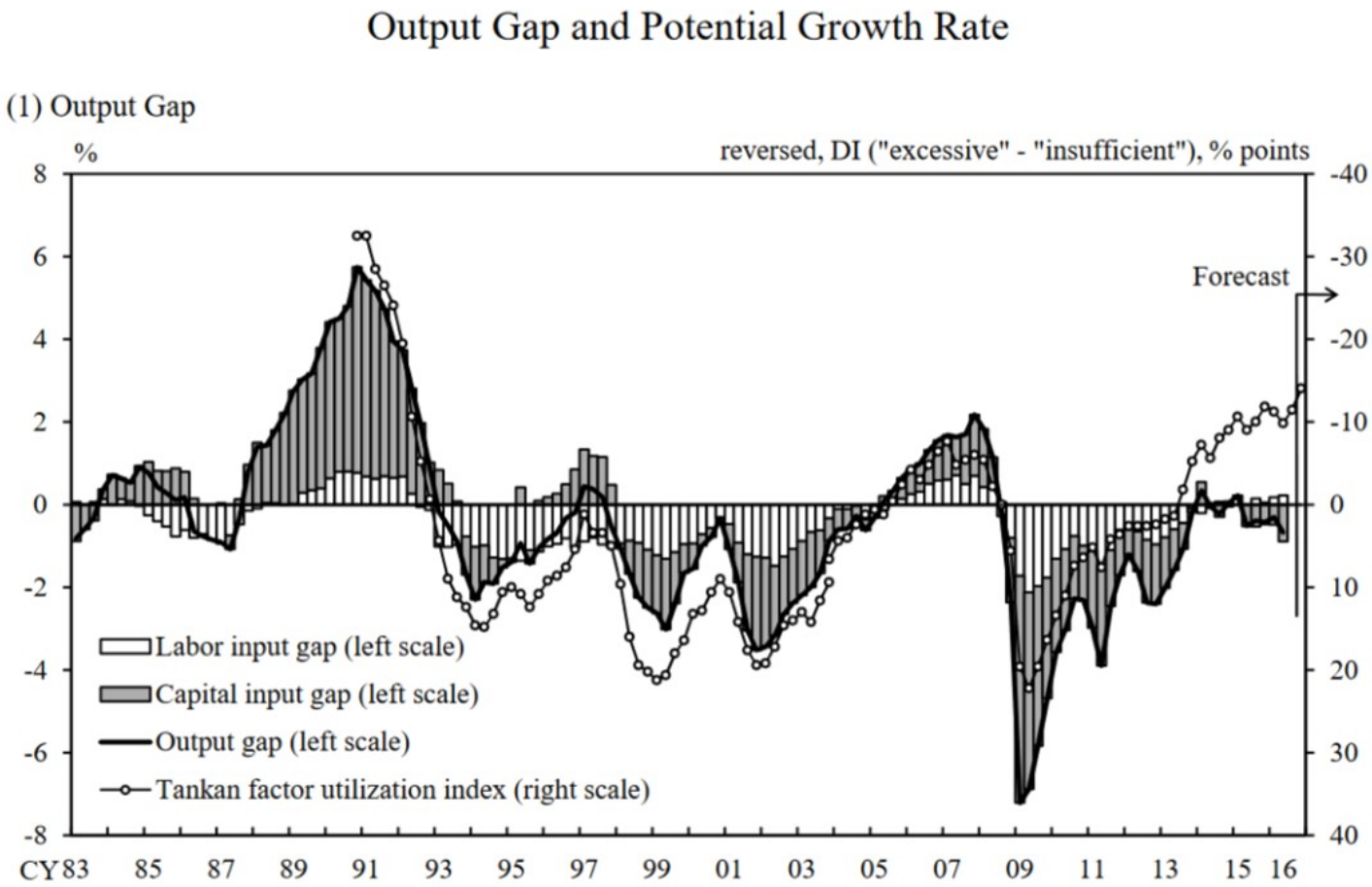
- There is a **bound** to recessions at the ZLB



Source: Gabaix (2016), p. 23

Less Costly ZLB

- ZLB in Japan since the 1990s is only "boundedly" costly



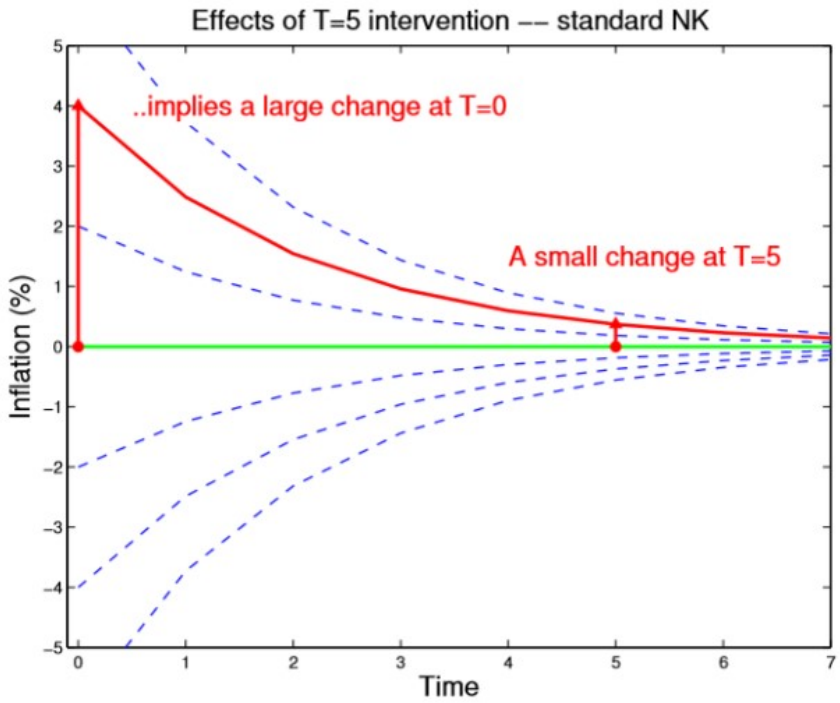
Source: Bank of Japan (2016)

Deterministic Model

- Recall the Taylor Rule: $\hat{R}_t = \Phi_\pi \hat{\Pi}_t + \Phi_x x_t + \epsilon_t$
  - $\Phi_\pi > 1$ would indicate an **active** monetary policy
  - At the ZLB, this cannot be implemented
- $M < 1$ makes up for this issue
- "Sunspot" Equilibria in traditional model are replaced by a single, stable equilibrium in the behavioral model

Sunspot Equilibria

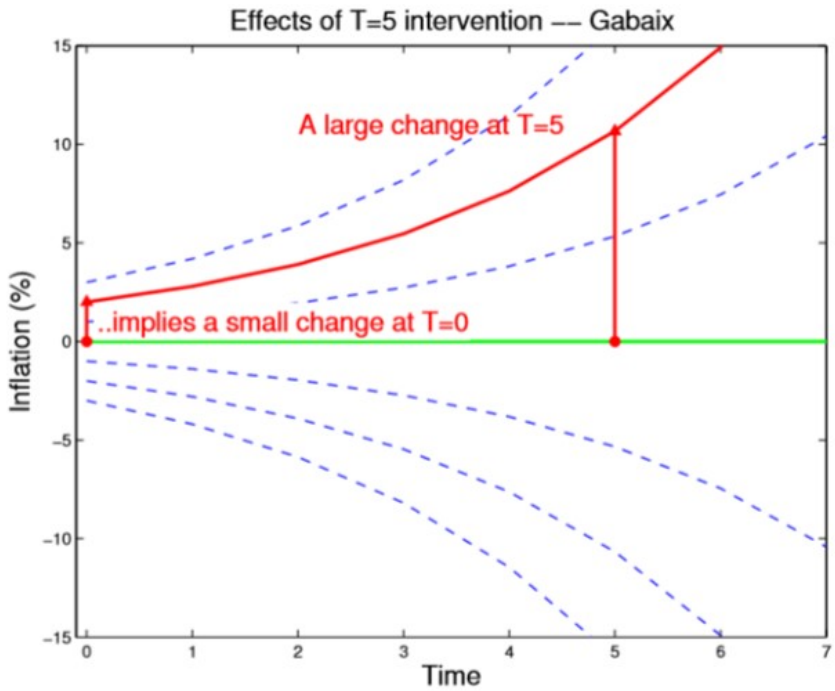
- $i = 0$, $\phi = 1$, $M = 1$
- More than one stable path looking forward



Source: Cochrane (2016), p. 9

One Stable Path

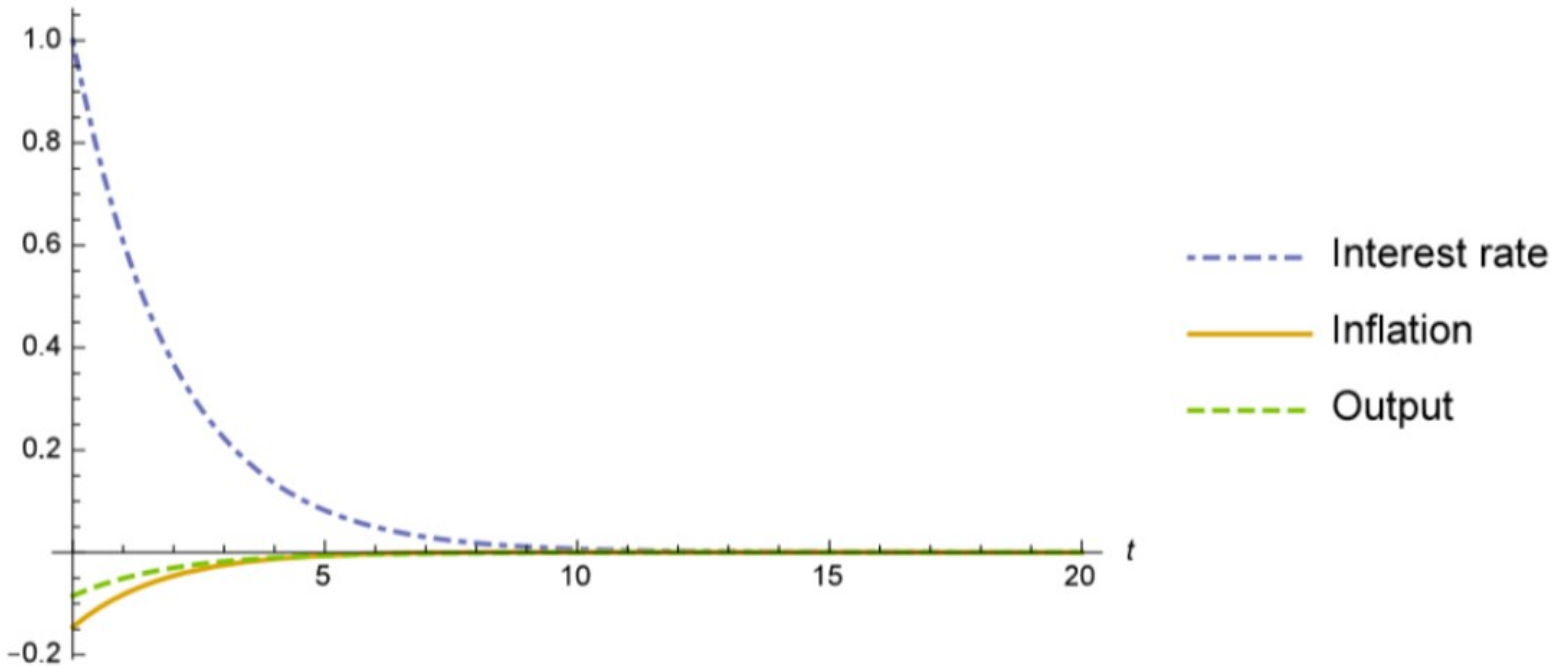
- $i = 0$, $\phi = 1$, $M < 1$
- Explosive inflation on all but one path



Source: Cochrane (2016), p. 9

Fisher and Keynes

- Inflation and output after a temporary increase in the nominal interest rate:



Source: Gabaix (2016), p. 33

Cochrane Critique

- Undoubtedly an important paper
- Main contribution: replace active monetary policy (impossible at ZLB) with behavioral parameter
- "Too important to be true" (Cochrane, p. 15)

Cochrane Critique

- Rather than assuming rationality and accepting irrational influence, Gabaix assumes irrationality
- If people become more rational or prices become flexible, problems might emerge
- Why? Price flexibility demands more irrationality to achieve deterministic result
- Can the behavioral foundations be taken seriously?

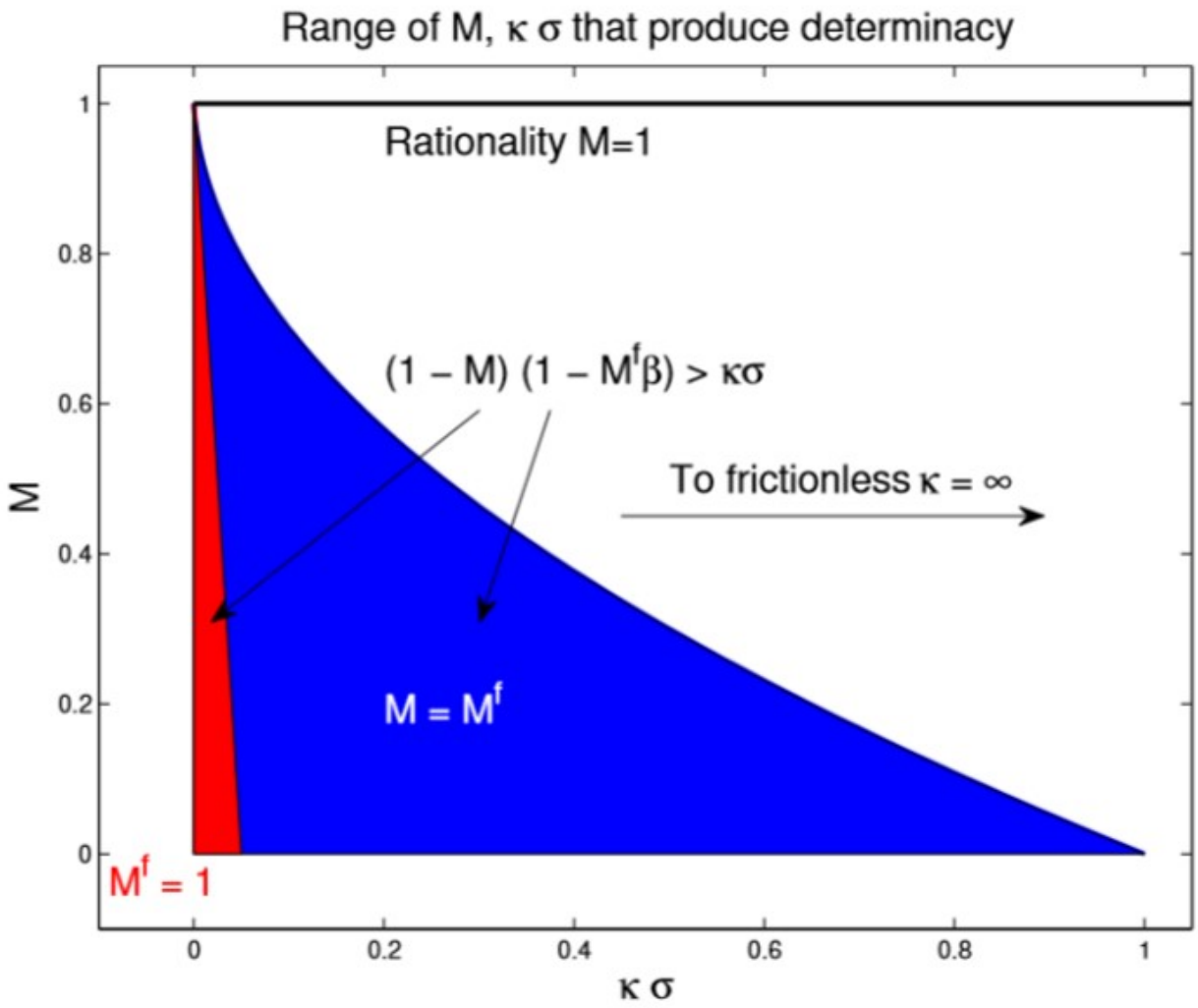
Cochrane Critique

- Condition that ensures both eigenvalues of the reduced form model are less than 1:

$$\frac{(1-\beta M^f)(1-M)}{\kappa\sigma} < 1$$

- We see a trade-off between price flexibility (κ) and rationality

Cochrane Critique



Source: Cochrane (2016), p. 15

In a nutshell...

"In conclusion, we have a model with quite systematic microfoundations, empirical support in its non-standard features, that is also simple to use." (Gabaix, p. 34)

"Gabaix offers a fundamental change of the basic story of monetary economics. A discrete and large amount of irrationality lies at the core of the basic sign, stability, and mechanism of monetary policy." (Cochrane, p. 23)

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