Accounting for Credibility: Monetary-Fiscal Interactions and the Credibility of Central Bank Mandates

Luigi Bocola* **Gaston Chaumont†** **Alessandro Dovis‡**
Rishabh Kirpalani§

August 2024 – work in progress

Abstract

The delegation of monetary policy to independent central banks has been a common strategy in many emerging market economies to insulate monetary policy from fiscal pressures and reduce inflation. In particular, many of these economies have adopted some form of inflation targeting. However, governments retain the ability to undermine central bank independence through moral suasion or legislative actions. In this paper, we investigate the conditions under which the delegation of monetary policy to an independent central bank is credible.

We develop a model for fiscal and monetary policy determination in the tradition of Sargent and Wallace (1981). Ex-ante, the government has incentives to pre-commit to an inflation rate and delegate monetary authority to an independent central bank with a narrow mandate (inflation targeting). Ex-post, however, the government faces tempations to revoke this independence in order to support the cost of servicing the debt by generating seigniorage revenues. The likelihood that the government will adhere to its commitment depends on shocks to both fiscal fundamentals and the costs of reneging on the mandate. We interpret the former as fiscal consolidation choices and the latter as changes in institutions undertaken by governments. The economy endogenously transitions between a "fiscal-dominant" regime where the fiscal authority interferes with monetary policy to generate seigniorage revenues and inflation promises are not credible and a "monetary-dominant" regime where monetary policy adheres to its commitment.

*Stanford University and NBER.
†University of Rochester.
‡University of Pennsylvania and NBER.
§University of Wisconsin-Madison.

We use the model as a measurement device to interpret the pattern of fiscal and monetary policies in Latin American economies. Using the model's implications for the covariance between deficit and inflation, we study the relative contribution of fiscal consolidation efforts and institutional changes in successful disinflationary episodes.

Finally, we use the estimated model to study the optimal design of a central bank mandate taking credibility into consideration.

Accounting for Credibility: Monetary-Fiscal Interactions and the Credibility of Central Bank Mandates

Luigi Bocola, Gaston Chaumont, Alessandro Dovis, Rishabh Kirpalani

Stanford, Rochester, Penn, Wisconsin

SED Winter Meeting
Buenos Aires, December 2024

This paper

- How do countries manage to end periods of high inflation?
- Independent central banks and inflation targeting mandates to isolate monetary policy from fiscal considerations
- However, governments can always take independence away
- In this paper, we investigate
  - Conditions that make central bank mandate credible
  - Contribution of delegation/institutional arrangements versus fundamentals in disinflationary episodes

What we do

- Economy in the tradition of Sargent-Wallace
  - Model interaction between fiscal and monetary authority
- Ex-ante, the government has incentives to delegate monetary authority to an independent central bank
  - Commitment to inflation valuable
- Ex-post, temptation to take independence away and increase inflation
  - To reduce costs of nominal liabilities
- Credibility of delegation depends on
  - Fiscal fundamentals
  - Institutions/reputational losses

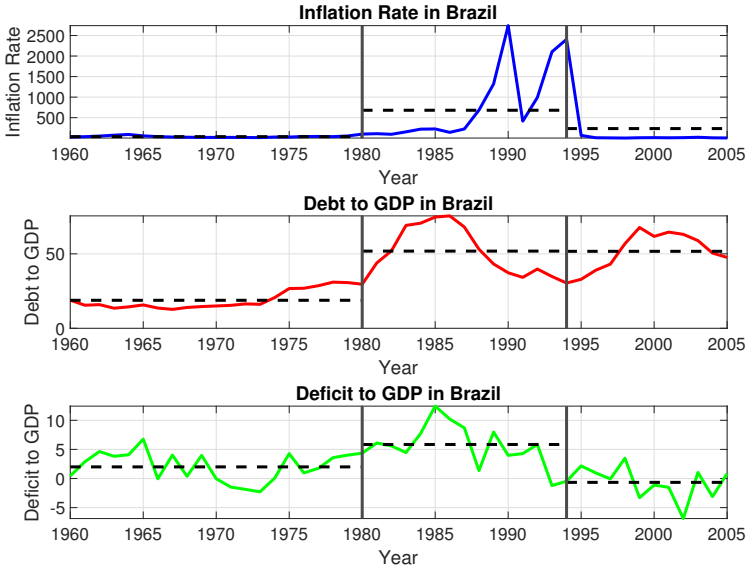
Goal

- Model as a measurement device to interpret the path of fiscal and monetary policy outcomes

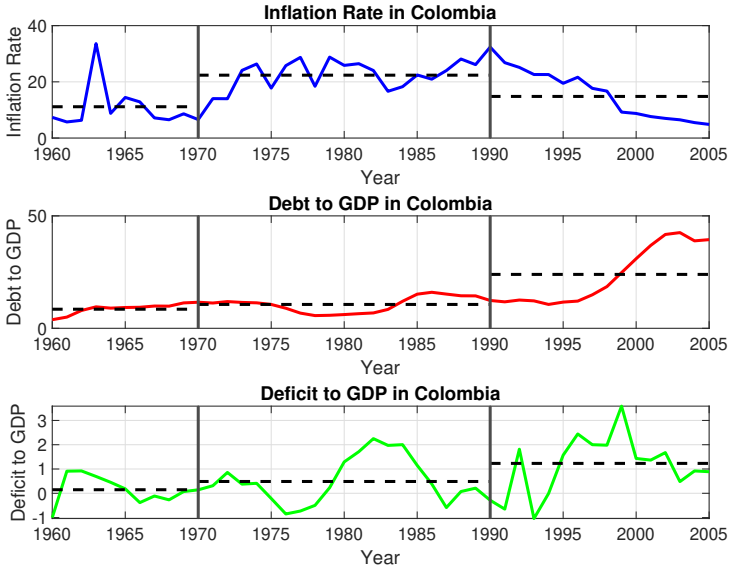
- Successful disinflationary episodes can be driven by
  - Fundamentals: fiscal consolidations, low debt-to-GDP ratios
  - Credible institutions

- Can distinguish by looking at comovement between inflation and debt (deficits)
  - If fundamentals then expect debt and inflation to move together at low frequency
  - If credible institutions then debt and inflation to move in opposite directions at low frequency

Brazil: inflation ↓, debt-to-GDP ↓ and deficit ↓



Colombia: inflation ↓, debt-to-GDP ↑ and deficit ↑



Related literature

- Sargent-Wallace, Lucas-Stokey, AMSS, Calvo, Chang, Alvarez-Neumeier-Kehoe, Espino-Kozlowski-Martin-Sanchez, Bassetto-Sargent
- Sargent, Sargent-Williams-Zha
- Leeper, Bianchi, Bianchi-Ilut, Bianchi-Melosi, Bianchi-Faccini-Melosi, Witheridge
- Atkeson-Chari-Kehoe, Piguillem-Schneider, Dovis-Kirpalani, King-Liu, Halac-Yared, Kostadinov-Roldan, Ramirez

Sargent-Wallace like economy

- Closed economy
- State s_t
- Stand-in household preferences

$$\sum_{t=0}^{\infty} \sum_{s^t} \beta^t \Pr\left(s^t\right) U\left(C\left(s^t\right), L\left(s^t\right), M\left(s^{t-1}\right)/P\left(s^t\right), G\left(s^t\right)\right)$$

with

$$U\left(C, L, M/P, G\right) = C - \nu(L) + v(M/P) + \theta\left(s_t\right) u(G)$$

- Resource constraint

$$C\left(s^t\right) + G\left(s^t\right) \leq L\left(s^t\right)$$

- Impatient – $\hat{\beta} \leq \beta$ – government finances G with
  - distortionary labor income taxes
  - real debt
  - money

Equilibrium

Allocation, prices and policies such that

- Household's problem

$$\max \sum_{t=0}^{\infty} \sum_{s^t} \beta^t \Pr\left(s^t\right) \left[C\left(s^t\right) - \nu\left(L\left(s^t\right)\right) + v\left(\frac{m\left(s^{t-1}\right)}{P\left(s^t\right)}\right)\right]$$

  subject to

$$\begin{aligned} & P\left(s^t\right) C\left(s^t\right) + Q\left(s^t\right) b\left(s^t\right) + m\left(s^t\right) \\ & \leq \left(1 - \tau\left(s^t\right)\right) W\left(s^t\right) L\left(s^t\right) + P\left(s^t\right) b\left(s^{t-1}\right) + m\left(s^{t-1}\right) \end{aligned}$$

- Government budget constraint

$$P\left(s^t\right) B\left(s^{t-1}\right) + M\left(s^{t-1}\right) + P\left(s^t\right) G\left(s^t\right) \leq \tau\left(s^t\right) W\left(s^t\right) L\left(s^t\right) + Q\left(s^t\right) B\left(s^t\right) + M\left(s^t\right)$$

- Firm's optimality $W\left(s^t\right) = P\left(s^t\right)$ and market clearing

Implementability conditions

- Derive a set of restrictions that characterize the equilibrium
- Household's optimality

$$\left(1-\tau(s^t)\right)=\nu'\left(L(s^t)\right)$$

$$\frac{1}{P\left(s^t\right)}=\beta E_t\left[\frac{1}{P\left(s^{t+1}\right)}+v'\left(\frac{M\left(s^t\right)}{P\left(s^{t+1}\right)}\right)\frac{1}{P\left(s^{t+1}\right)}\right]$$

$$\frac{Q\left(s^t\right)}{P\left(s^t\right)}=\beta$$

Implementability conditions, cont.

- From labor supply condition define tax revenues as

$$(1-\tau) = \nu'(L) \rightarrow T \equiv \tau L = \left(1 - \nu'(L)\right) L$$

Let Δ be **primary surplus**, define **disutility over surpluses**

$$U(\Delta, s) = \max_{L,G} (L - G) - \nu(L) + \theta(s)\, u(G)$$

subject to

$$\Delta \geq \left(1 - \nu'(L)\right) L - G$$

  - U is decreasing and concave in Δ

Implementability conditions, cont.

- From the money demand

$$\frac{1}{P\left(s^{t}\right)}=\beta E_{t}\left[\frac{1}{P\left(s^{t+1}\right)}+v'\left(\frac{M\left(s^{t}\right)}{P\left(s^{t+1}\right)}\right)\frac{1}{P\left(s^{t+1}\right)}\right]$$

- Normalize nominal variables by $M\left(s^{t-1}\right)$:

$$\begin{aligned}p\left(s^{t}\right)&=P\left(s^{t}\right)/M\left(s^{t-1}\right)\\ \mu\left(s^{t}\right)&=M\left(s^{t}\right)/M\left(s^{t-1}\right)\\ \phi\left(s^{t}\right)&=1/p\left(s^{t}\right)=M\left(s^{t-1}\right)/P\left(s^{t}\right)\end{aligned}$$

so

$$\begin{aligned}\mu\left(s^{t}\right)\phi\left(s^{t}\right)&=\beta E_{t}\left[\phi\left(s^{t+1}\right)+v'\left(\phi\left(s^{t+1}\right)\right)\phi\left(s^{t+1}\right)\right]\\ &=\beta E_{t}H\left(\phi\left(s^{t+1}\right)\right)\end{aligned}$$

Implementability conditions

An outcome $\left\{\Delta\left(s^t\right), b\left(s^t\right), \phi\left(s^t\right), \mu\left(s^t\right)\right\}$ is implementable iff it satisfies

- GBC:

$$b\left(s^{t-1}\right) + \phi(s^t) = \Delta\left(s^t\right) + \beta b\left(s^t\right) + \mu\left(s^t\right)\phi\left(s^t\right)$$

- Euler equation for money holdings:

$$\mu\left(s^t\right)\phi\left(s^t\right) = \beta \sum_{s_{t+1}} \Pr\left(s_{t+1}|s_t\right) H\left(\phi\left(s^{t+1}\right)\right)$$

- Surplus feasibility $\Delta\left(s^t\right) \leq \max_L \left(1 - \nu'\left(L\right)\right) L$

Implementability conditions

An outcome $\left\{\Delta\left(s^t\right), b\left(s^t\right), \phi\left(s^t\right), \mu\left(s^t\right)\right\}$ is implementable iff it satisfies

- GBC:

$$b\left(s^{t-1}\right) + \phi(s^t) = \Delta\left(s^t\right) + \beta b\left(s^t\right) + \mu\left(s^t\right)\phi\left(s^t\right)$$

- Euler equation for money holdings:

$$\mu\left(s^t\right)\phi\left(s^t\right) = \beta \sum_{s_{t+1}} \Pr\left(s_{t+1}|s_t\right) H\left(\phi\left(s^{t+1}\right)\right)$$

- Surplus feasibility $\Delta\left(s^t\right) \leq \max_L \left(1 - \nu'\left(L\right)\right) L$

Inflation

$$1 + \pi\left(s^{t+1}\right) = \frac{\mu\left(s^t\right)\phi\left(s^t\right)}{\phi\left(s^{t+1}\right)}$$

Value for the government

$$V\left(s^t\right) = U\left(\Delta\left(s^t\right), s_t\right) + v\left(\phi\left(s^t\right)\right) + \hat{\beta} E_t V\left(s^{t+1}\right)$$

Policy determination and expectations

- Ramsey outcome not time-consistent
  - Ex-post gov't wants to reduce value of real money balances
- Government cannot commit to its policies
- Any implementable outcome $\left\{\Delta\left(s^t\right), b\left(s^t\right), \phi\left(s^t\right), \mu\left(s^t\right)\right\}$ that satisfies

$$V\left(s^t\right) \geq \underline{V}\left(b\left(s^{t-1}\right), s_t\right)$$

  can be SPE outcome
- How to select among these outcomes?
- How can government manipulate hh's expectations?
- How hh's coordinate on punishment if there is a deviation?
  - Sargent, Critique and Consequence

Our approach

- Gov't tries to commit to inflation next period
  - Promise to deliver inflation π^* next period
  - Delegate monetary policy to independent central bank with inflation targeting mandate
- But can deviate
  - Take independence away and re-optimize
- Costs if promised inflation not delivered: $\xi(s)$
  - Stands for reputation losses, coordination to worse eqlbrm, institutional details, etc.

Recursive formulation

- State $S = (b, \phi, s)$ where ϕ is promised target
- Two "regimes"
  - **Monetary dominance**: Gov't respect target, value V_{md}
  - **Fiscal dominance**: Gov't deviates from set target, value V_{fd}
- Gov't value

$$V(b, \phi, s) = \max \{V_{md}(b, \phi, s), V_{fd}(b, s) - \xi(s)\}$$

- $\eta(S)$: indicator for whether target respected
- $J(b', \phi', s)$: Expected marginal value of real balances next period

Monetary dominance

Respect set target ϕ

$$V_{md}(b,\phi,s) = \max_{\Delta,b',\mu,\phi'} U(\Delta,\theta) + v(\phi) + \hat{\beta}\sum_{s'} \Pr\left(s'|s\right) V\left(b',\phi',s'\right)$$

subject to

$$\Delta = b + \phi - \beta b' - \mu\phi$$

$$\mu\phi = J\left(b',\phi',s\right)$$

New inflation target is

$$1 + \pi^* = \frac{\mu\phi}{\phi'}$$

Fiscal dominance

Deviate from set target ϕ

$$V_{fd}(b,s) = \max_{\phi,\Delta,b',\mu,\phi'} U(\Delta,\theta) + v(\phi) + \hat{\beta} \sum_{s'} \Pr\left(s'|s\right) V\left(b',\phi',s'\right)$$

subject to

$$\Delta = b + \phi - \beta b' - \mu\phi$$

$$\mu\phi = J\left(b',\phi',s\right)$$

Fiscal dominance

Deviate from set target ϕ

$$V_{fd}(b,s) = \max_{\phi,\Delta,b',\mu,\phi'} U(\Delta,\theta) + v(\phi) + \hat{\beta}\sum_{s'} \Pr\left(s'|s\right) V\left(b',\phi',s'\right)$$

subject to

$$\Delta = b + \phi - \beta b' - \mu\phi$$

$$\mu\phi = J\left(b',\phi',s\right)$$

Optimal ϕ_{fd}:

$$-U'(\Delta_{fd},\theta) = v'(\phi_{fd})$$

Tight correlation b/w deficits $(-\Delta_{fd})$ and ϕ_{fd}

Marginal value of money holdings

$$J\left(b',\phi',s\right)=\beta\sum_{s'}\Pr\left(s'|s\right)\left[\eta\left(b',\phi',s'\right)H\left(\phi'\right)+\left(1-\eta\left(b',\phi',s'\right)\right)H\left(\phi_{fd}\left(b',s'\right)\right)\right]$$

$$\eta\left(b',\phi',s'\right)=\begin{cases}1 & \text{if } V_{md}\left(b,\phi',s'\right)\geq V_{fd}\left(s'\right)-\xi\left(s'\right)\\ 0 & \text{if } V_{md}\left(b,\phi',s'\right)<V_{fd}\left(s'\right)-\xi\left(s'\right)\end{cases}$$

Marginal value of money holdings

$$J\left(b',\phi',s\right)=\beta\sum_{s'}\Pr\left(s'|s\right)\left[\eta\left(b',\phi',s'\right)H\left(\phi'\right)+\left(1-\eta\left(b',\phi',s'\right)\right)H\left(\phi_{fd}\left(b',s'\right)\right)\right]$$

$$\eta\left(b',\phi',s'\right)=\begin{cases}1 & \text{if } V_{md}\left(b,\phi',s'\right)\geq V_{fd}\left(s'\right)-\xi\left(s'\right)\\ 0 & \text{if } V_{md}\left(b,\phi',s'\right)<V_{fd}\left(s'\right)-\xi\left(s'\right)\end{cases}$$

- Nests
  - Ramsey outcome if ξ large enough $\rightarrow \eta=1$ always

$$J\left(b',\phi',s\right)=\beta H\left(\phi'\right)$$

  - Markov outcome if $\xi=0\rightarrow \eta=0$ always

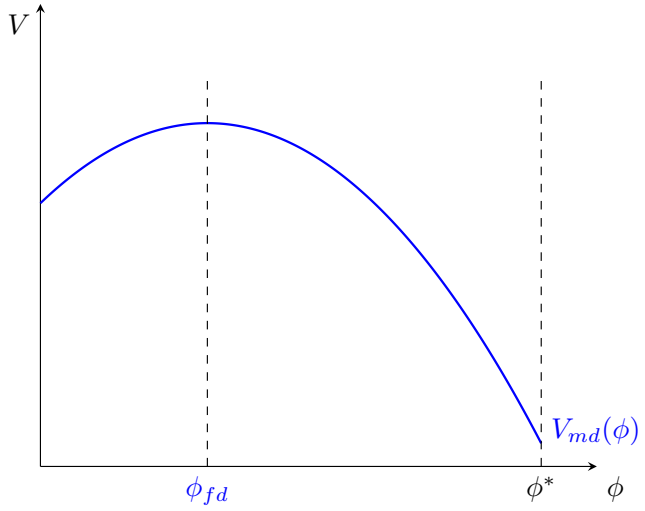
$$J\left(b',\phi',s\right)=\beta\sum_{s'}\Pr\left(s'|s\right)H\left(\phi_{fd}\left(b',s'\right)\right)$$

Credibility of mandates

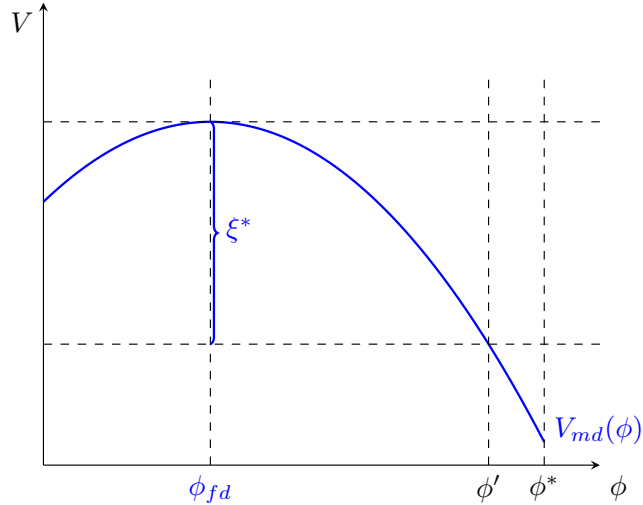
Depends on

- target level ϕ'
- institutions/reputational cost: ξ
- fiscal fundamentals: b and θ

Credibility of mandates



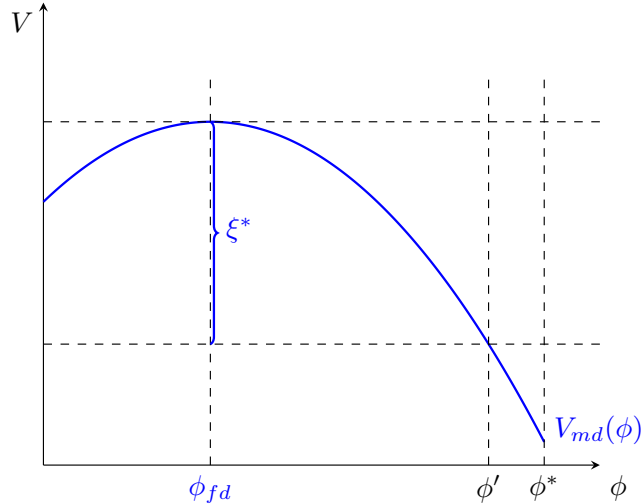
Credibility of mandates



Satisfy target iff $\xi \geq \xi^*$

Less ambitious target $\rightarrow$ higher credibility

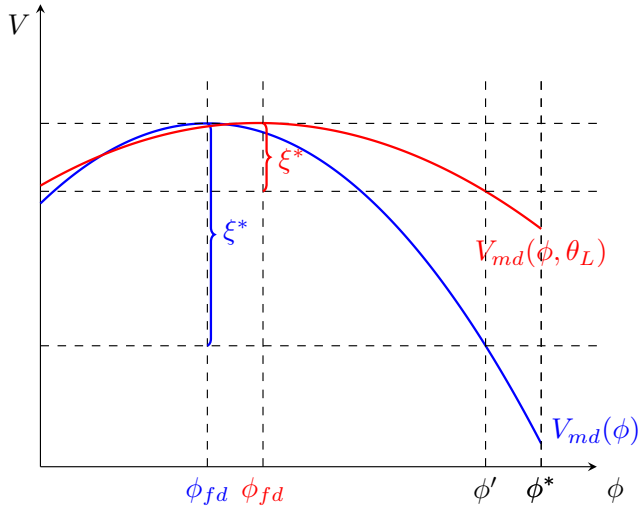
Credibility of mandates



Satisfy target iff $\xi \geq \xi^*$

Higher (expected) cost $\rightarrow$ higher credibility

Credibility of mandates



If $\theta \downarrow$ (or $b \downarrow$) then more likely to satisfy target

Optimal inflation target

$$-U'(\Delta, \theta)\frac{\partial J}{\partial \phi'} + \hat{\beta} E \frac{\partial V}{\partial \phi'} = 0$$

- Inflation target

$$1 + \pi^* = \frac{\mu\phi}{\phi'} = \frac{J(\phi')}{\phi'} \text{ decreasing in } \phi'$$

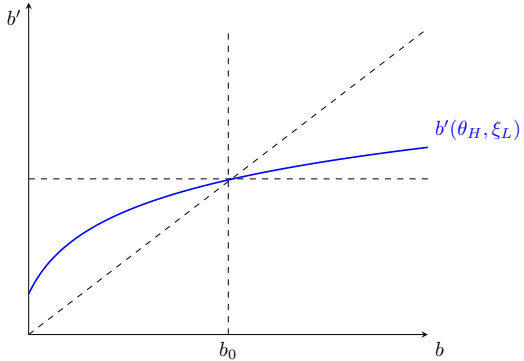
- Target ϕ' distorted downward relative to Ramsey outcome
  - Lower ϕ increases incentives to respect target ($V_{md} > V_{fd} - \xi'$)
  - This increases expected marginal value of money as $\phi' > \phi'_{fd}$

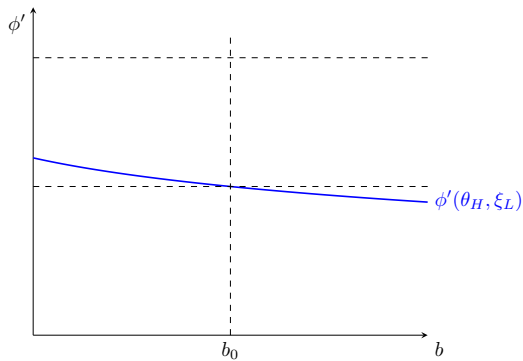
Optimal debt issuance

$$-U'(\Delta,\theta)\left(1-\left|\frac{\partial J}{\partial b'}\right|/\beta\right)+\frac{\hat{\beta}}{\beta}E\frac{\partial V}{\partial b'}=0$$

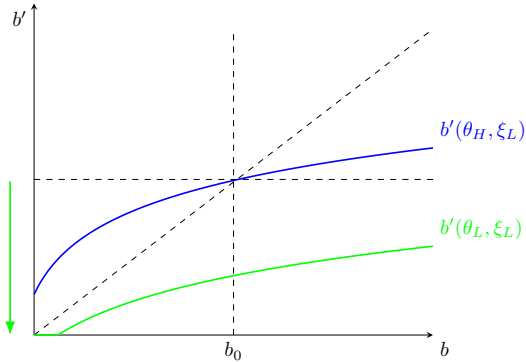
- Debt issuance distorted by incentive wedge $\left|\frac{\partial J}{\partial b'}\right| \geq 0$
  - $\left|\frac{\partial J}{\partial b'}\right|$ zero in Ramsey outcome
- Reduce debt issuance to incentivize next period gov't to
  - respect target more often
  - set higher ϕ_{fd} in case of switch to fiscal dominance

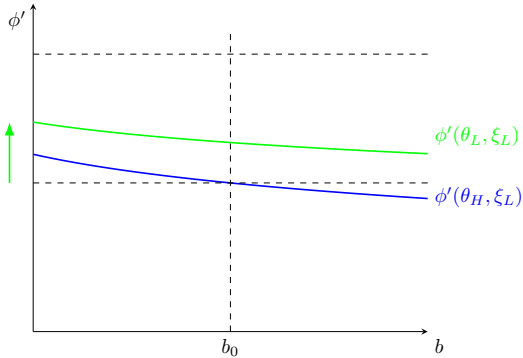
Dynamics



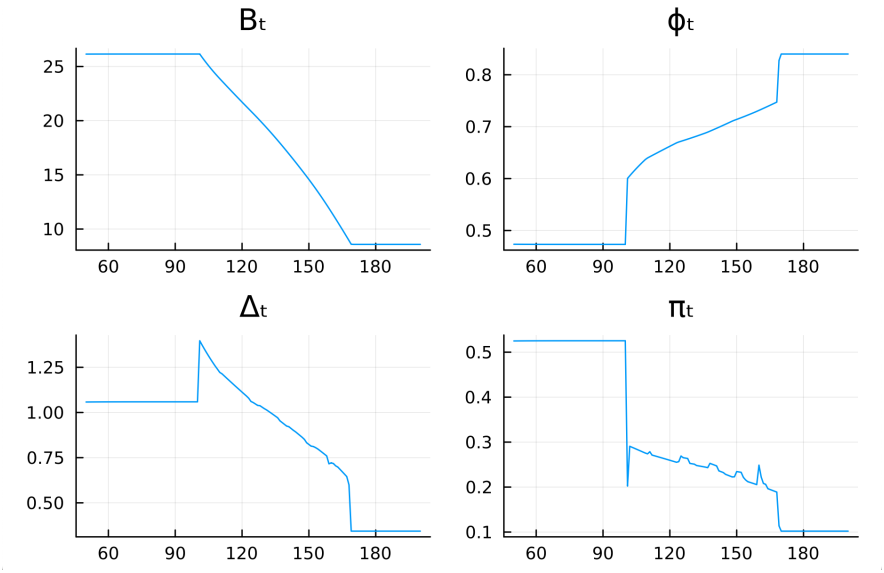


Fundamental disinflation: $\theta_H \to \theta_L$

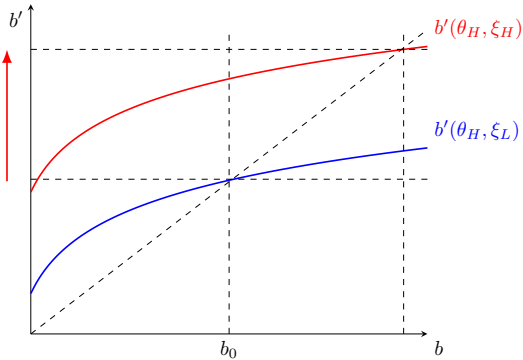


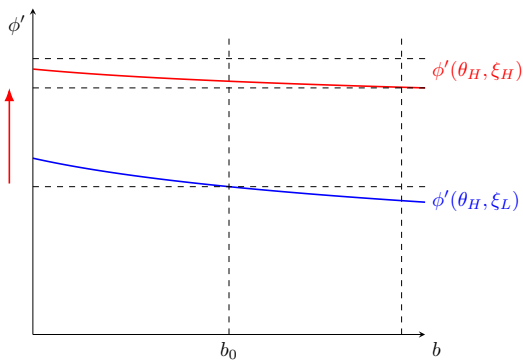


Fundamental disinflation: $\theta_H \to \theta_L$

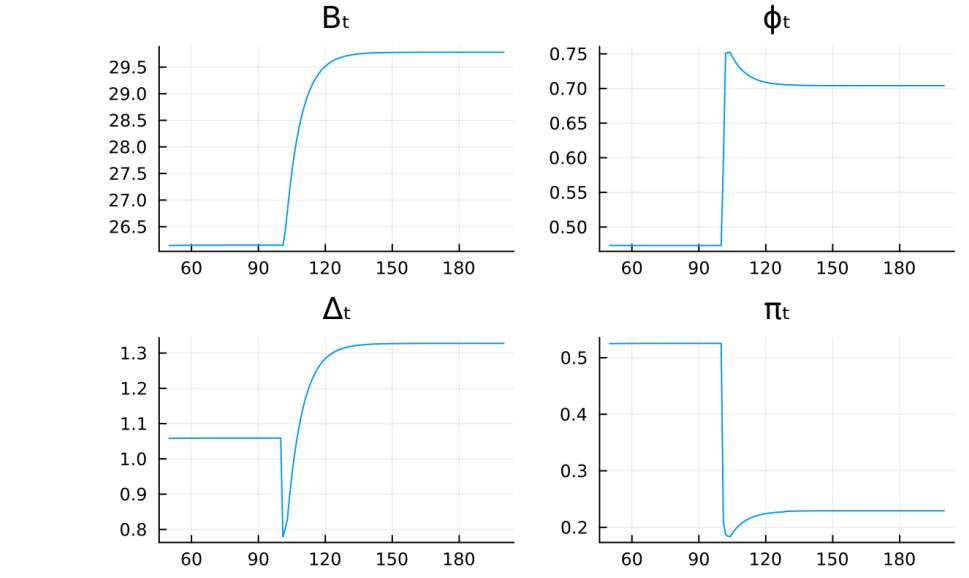


Institutional disinflation: $\xi_L \to \xi_H$





Institutional disinflation: $\xi_L \to \xi_H$



Conclusion

- Theory of endogenous fluctuations between fiscal and monetary dominance
- Conditions that make central bank mandate credible (monetary dominance)
- Successful disinflationary episodes can be driven by
  - Fundamentals
  - Credible institutions
- Different implications for co-movement of debt and inflation
  - Also: denomination and maturity of debt

Conclusion

- Theory of endogenous fluctuations between fiscal and monetary dominance
- Conditions that make central bank mandate credible (monetary dominance)
- Successful disinflationary episodes can be driven by
  - Fundamentals
  - Credible institutions
- Different implications for co-movement of debt and inflation
  - Also: denomination and maturity of debt
- Quantify contribution of fundamentals and institutions in disinflationary episodes
- (Political) cost of disinflation
  - Distortion term $\left|\frac{\partial J}{\partial b'}\right|$
- Laboratory to study
  - Optimal inflation targets
  - Contribution of fiscal rules