

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

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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

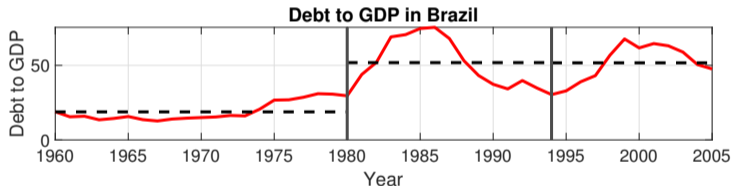
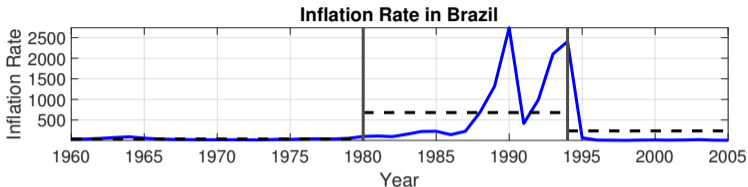
What we do

- 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

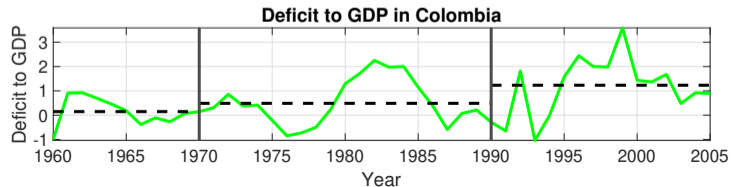
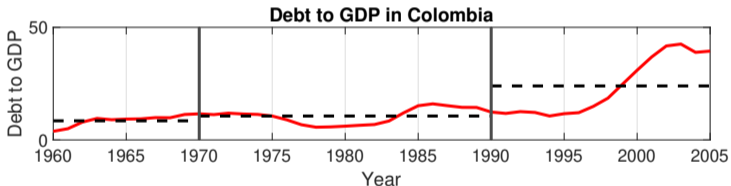
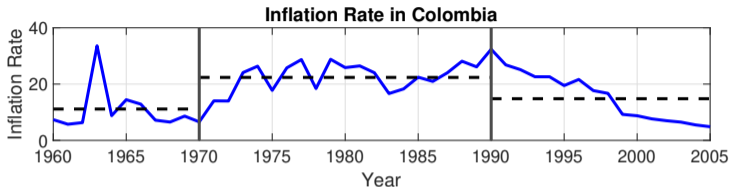
Goal

- 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, Dovic-Kirpalani, King-Liu, Halac-Yared, Kostadinov-Roldan, Ramirez

Sargent-Wallace like economy

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

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

with

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

- Resource constraint

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

- 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

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

subject to

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

- Government budget constraint

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

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

Implementability conditions

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

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

Implementability conditions, cont.

- From labor supply condition define tax revenues as

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

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

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

- U is decreasing and concave in Δ

Implementability conditions, cont.

- From the money demand

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

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

$$p(s^t) = P(s^t) / M(s^{t-1})$$

$$\mu(s^t) = M(s^t) / M(s^{t-1})$$

$$\phi(s^t) = 1/p(s^t) = M(s^{t-1}) / P(s^t)$$

so

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

Implementability conditions

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

- GBC:

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

- Euler equation for money holdings:

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

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

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Inflation

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

Value for the government

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

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 $\{\Delta(s^t), b(s^t), \phi(s^t), \mu(s^t)\}$ that satisfies

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

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 equlbrm, 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

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

subject to

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

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

New inflation target is

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

Fiscal dominance

Deviate from set target ϕ

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

subject to

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

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

Fiscal dominance

Deviate from set target ϕ

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

subject to

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

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

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

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

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

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- Nests

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

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

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

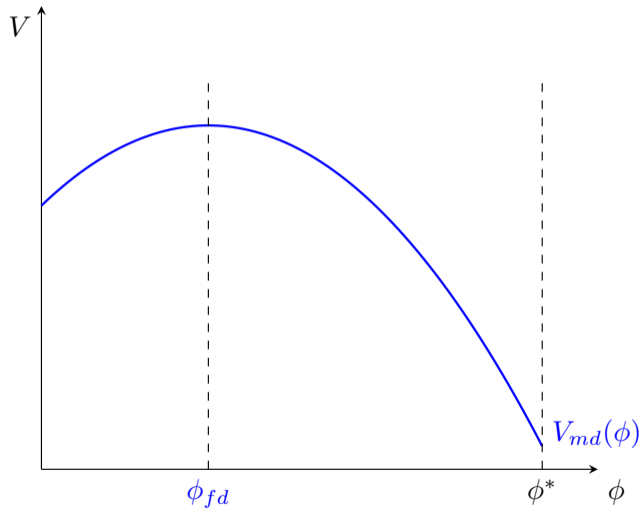
$$J(b', \phi', s) = \beta \sum_{s'} \Pr(s'|s) H(\phi_{fd}(b', s'))$$

Credibility of mandates

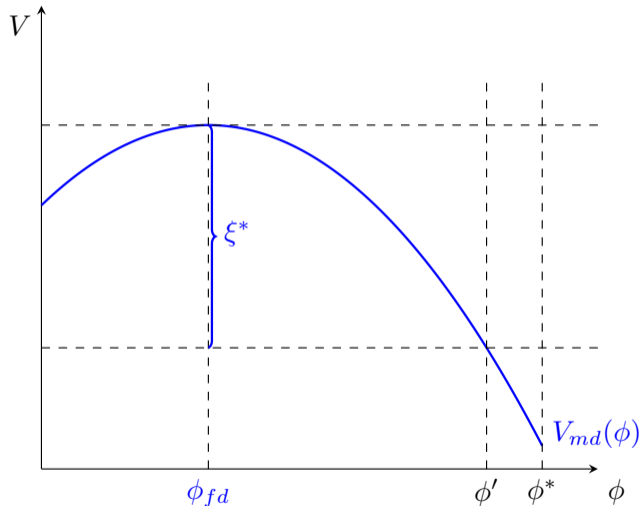
Depends on

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

Credibility of mandates



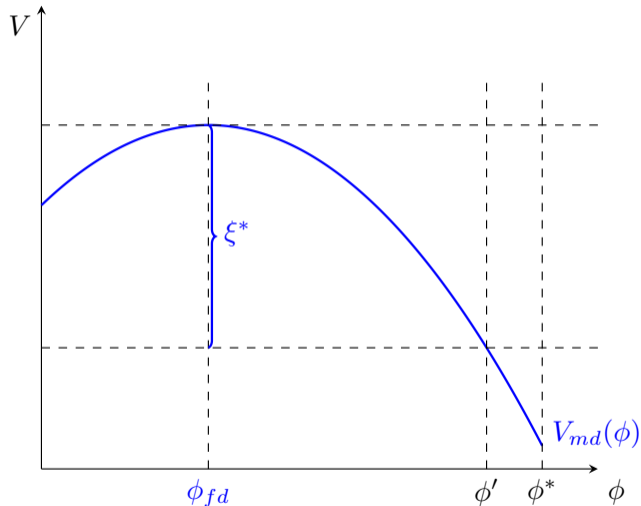
Credibility of mandates



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

Less ambitious target \rightarrow higher credibility

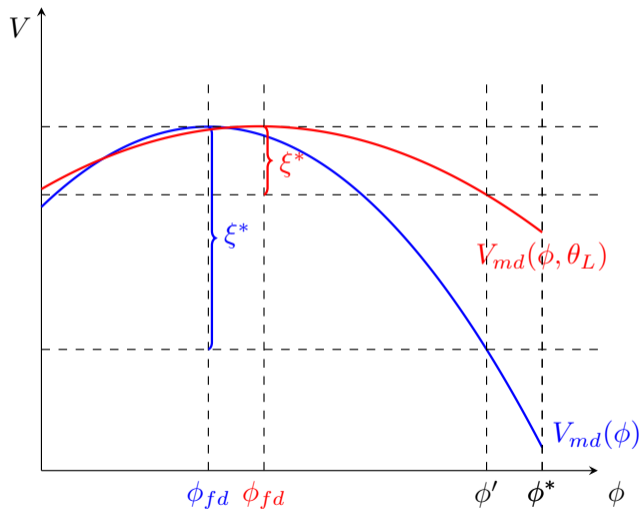
Credibility of mandates



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

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

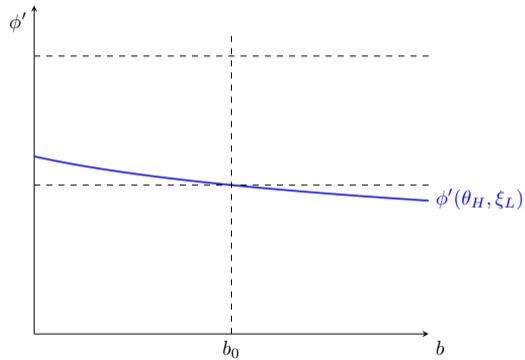
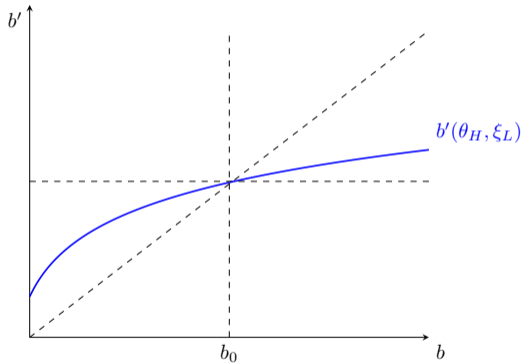
- Target ϕ' distorted downward relative to Ramsey outcome
 - Lower ϕ increases incentives to respect target ($V_{md} > V_{fd} - \xi'$)
 - This increases expected marginal value of money as $\phi' > \phi'_{fd}$

Optimal debt issuance

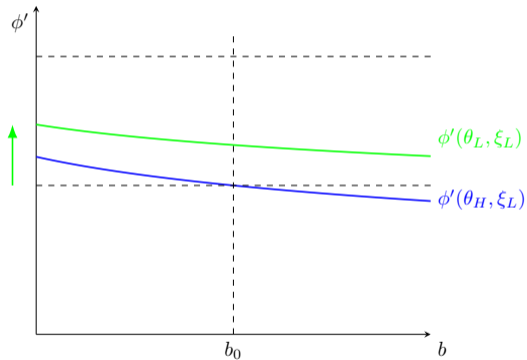
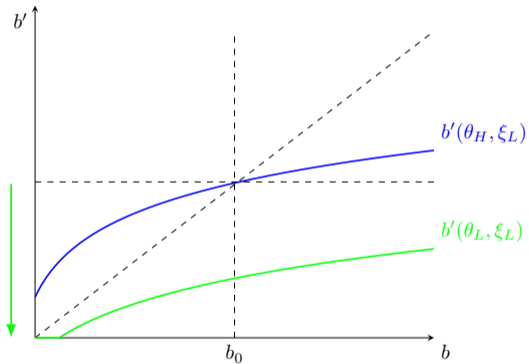
$$-U'(\Delta, \theta) \left(1 - \left| \frac{\partial J}{\partial b'} \right| / \beta \right) + \frac{\hat{\beta}}{\beta} E \frac{\partial V}{\partial b'} = 0$$

- 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

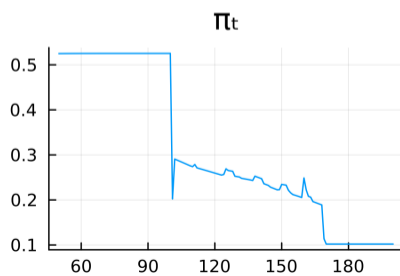
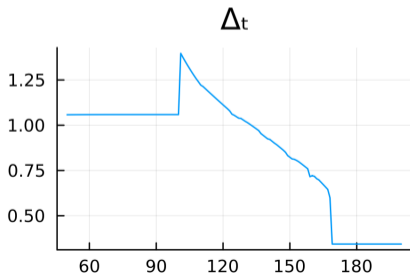
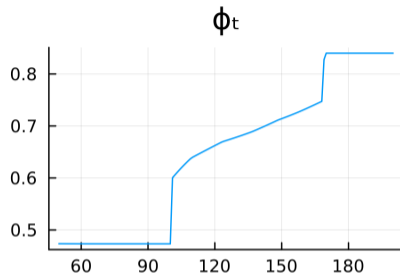
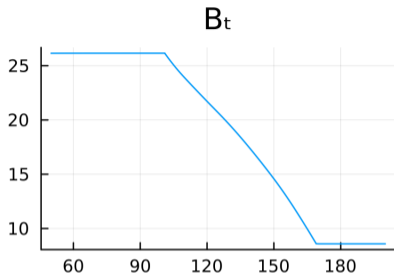
Dynamics



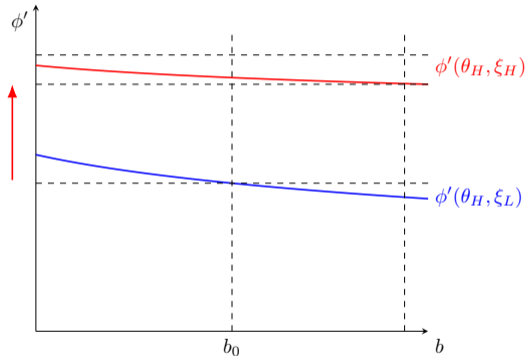
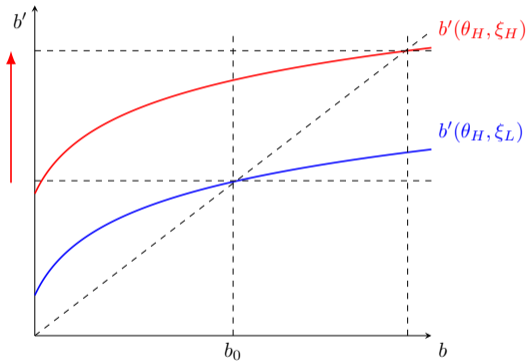
Fundamental disinflation: $\theta_H \rightarrow \theta_L$



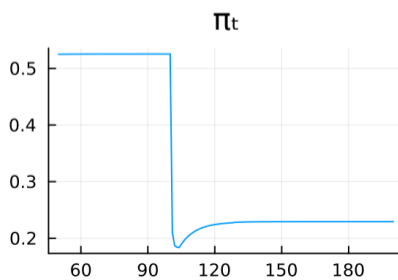
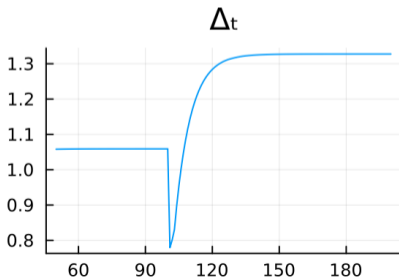
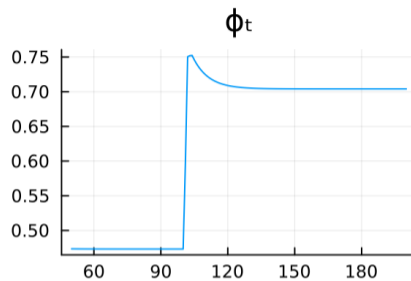
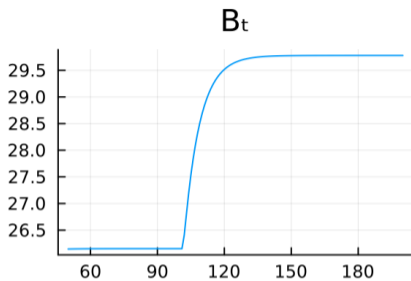
Fundamental disinflation: $\theta_H \rightarrow \theta_L$



Institutional disinflation: $\xi_L \rightarrow \xi_H$



Institutional disinflation: $\xi_L \rightarrow \xi_H$



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

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- 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