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

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Motivation

- In 1980s and 1990s, monetary policy delegated to
  - **Independent central banks**
  - **Inflation targeting mandates**

  Goal: isolate monetary policy from fiscal considerations
- However, governments can always take independence away
- Effectiveness depend on credibility of delegation

Motivation

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Questions

- When delegation to independent central bank more likely to work?
- Role of institution's credibility vs fundamentals for inflation and debt
- Model-based meaure of independence

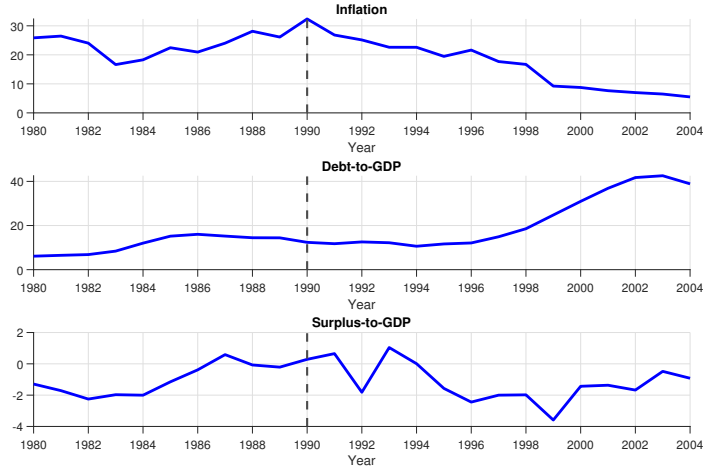
What we do

- Economy in the tradition of Sargent-Wallace
  - Interaction between fiscal and monetary authority
- Ex-ante, delegation to independent central bank with inflation targeting valuable
- Ex-post, temptation to revoke independence and reduce nominal liabilities
- Two shocks:
  - Fiscal fundamental: Marginal utility of government expenditures
  - Institutions/reputational losses: Costs of undermining central bank independence
- Economy endogenously flutuates between two regimes:
  - **Monetary-dominant**: Inflation target satisfied
  - **Fiscal-dominant**: Inflation target not satisfied

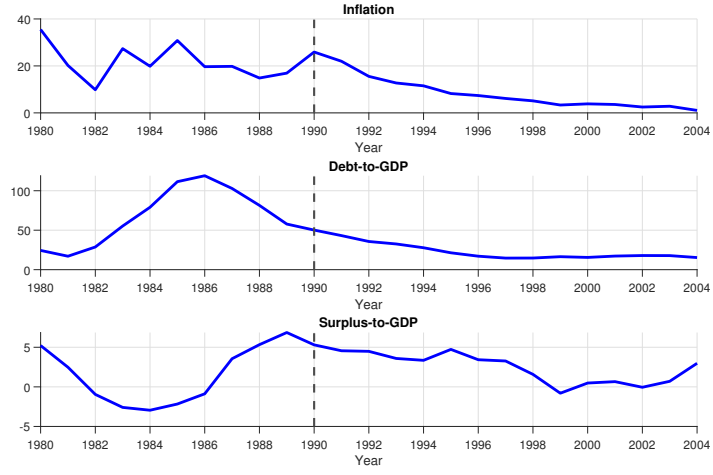
Results

- Two regimes have distinct predictions for debt and inflation dynamics
- Two types of disinflations
  - Fundamental (fiscal dominant):
    Low MU spending $\rightarrow$ low inflation and declining debt
  - Institutional (switch to monetary dominant):
    High revocation cost $\rightarrow$ low inflation and rising debt
- Credible monetary-dominant regime necessary for high debt and low inflation
  - But high debt increases likelihood of transition to fiscal-dominance
- Use model to understand debt-inflation dynamics for different countries
  - Model-based measure of central bank credibility

Colombia: Disinflation driven by institutions



Chile: Disinflation driven by fundamentals + institutions



Related literature

- Optimal fiscal-monetary policy: Sargent and Wallace (1981), Lucas and Stokey (1983), Nicolini (1998), Aiyagari et al. (2002), Calvo (1978), Chang (1998), Alvarez, Kehoe, and Neumeyer (2004), Espino et al. (2023)
  - Flexible model that span a large class of sustainable equilibrium outcomes
- Monetary-fiscal dominance: Leeper (1991), Bianchi (2013), Bianchi and Ilut (2017), Bianchi, Faccini, and Melosi (2023), Witheridge (2024);
  Loose-commitment: Debortoli and Nunes (2010), Debortoli et al. (2014), and Debortoli and Lakdawala (2016)
  - Endogenous policy and endogenous regime
- Fiscal and monetary history: Sargent (1982), Sargent, Williams, and Zha (2009), Kehoe and Nicolini (2022)
  - Decomposition based on government incentives
- Deeper model of reputations/institutions: Atkeson, Chari, and Kehoe (2001), Piguillem and Schneider (2016), Dovis and Kirpalani (2021), King and Liu (2021) Halac and Yared (2022), Ramirez (2024), Kostadinov and Roldan (2020)
  - Credibility measure to discipline and discriminate mechanisms

Outline

- Sargent-Wallace like economy
- Policy determination
- Two types of disinflations
- Quantify the role of fundamentals and institutions

Sargent-Wallace like economy

Environment

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

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

with

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

- 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

Economy admits simple reduced form in which

- Govt has preferences $U(\Delta, s)$ over primary surpluses, $\Delta = \tau W L - G$
  - U is decreasing and concave in Δ
  - If $\theta(s_H) > \theta(s_L)$ then $U_\Delta(\Delta, s_H) < U_\Delta(\Delta, s_L)$
- Can finance deficits with debt and seigniorage
- Seigniorage revenues function of policy and forward looking money demand

Implementability conditions

A fiscal and monetary 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

- 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:

$$\mu\left(s^t\right)\phi\left(s^t\right) = \beta \sum_{s_{t+1}} \Pr\left(s_{t+1}|s_t\right) \underbrace{\phi\left(s^{t+1}\right)\left[1 + v'\left(\phi\left(s^{t+1}\right)\right)\right]}_{\equiv H(\phi(s^{t+1}))}$$

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

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

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- Surplus feasibility $\Delta(s^t) \leq \max_L(1-\nu'(L))L$
- Inflation $\pi(s^t) = \frac{\mu(s^t)\phi(s^t)}{\phi(s^{t+1})}$
- 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

Ramsey outcome

Delegating monetary policy to a central bank w/ inflation targeting is desirable

- Suppose $v(\phi) = \kappa \frac{\phi^{1-\eta}}{1-\eta}$ for $\eta \in (0,1)$. Then,
  - Ramsey outcome follows the Friedman-rule.
  - $\phi(s^t) \to \infty$ and $v'(\phi(s^t)) \to 0$ for $t \geq 1, s^t$
  - If $\phi(s^t) \leq \phi^*$, then $\phi'(s^t) = \phi^*$ for all $t \geq 1$ and s^t
  - Constant inflation $1 + \pi_R = \beta \left(1 + \kappa (\phi^*)^{-\eta}\right)$
- Constant inflation targeting approximately optimal for different $v(\phi)$

Policy determination and expectations

- Ramsey outcome is not time consistent
  - Ex-post gov't wants to reduce value of real money balances
- Consider policy without commitment
- Any implementable outcome $\left\{\Delta\left(s^t\right), b\left(s^t\right), \phi\left(s^t\right), \mu\left(s^t\right), \pi\left(s^t\right)\right\}$ 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 do private agents 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 CB 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

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 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

$$\begin{aligned} \Delta &= b + \phi - \beta b' - \mu\phi \\ \mu\phi &= J\left(b',\phi',s\right) = \text{ expected MB of money holdings} \end{aligned}$$

New inflation target is

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

Fiscal dominance

Deviate from set target ϕ

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

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Fiscal dominance

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subject to

$$\begin{aligned} \Delta &= b + \phi - \beta b' - \mu\phi \\ \mu\phi &= J\left(b',\phi',s\right) \end{aligned}$$

Optimal ϕ_{fd}:

$$\underbrace{-U'(\Delta_{fd},\theta)}_{\text{MC of primary surpluses}} = \underbrace{v'(\phi_{fd})}_{\text{MB of real balances}}$$

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

Expected marginal value of money holdings

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

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

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- 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

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

Characterization

Credibility of mandates

Target is satisfied if

$$\begin{aligned} V_{md}\left(b', \phi', s'\right) &\geq V_{fd}\left(b', s'\right) - \xi\left(s'\right) \\ &= \max_{\phi_{fd}} V_{md}\left(b', \phi_{fd}, s'\right) - \xi\left(s'\right) \end{aligned}$$

Depends on

- Target level ϕ': less ambitious target $\rightarrow$ higher credibility
- Institutions/reputational cost ξ: higher (expected) cost $\rightarrow$ higher credibility
- Fiscal fundamentals: If $\theta \downarrow$ (or $b \downarrow$) $\rightarrow$ higher credibility

Details

Optimal inflation target

- 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 $\phi' > \phi'_{fd}$

  Similar to Dovis-Kirpalani (2021)

- Incentive to reduce ϕ' (raise the inflation target) is smaller if ξ' is large

Optimal debt issuance

- Debt issuance distorted downward relative to Ramsey outcome

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

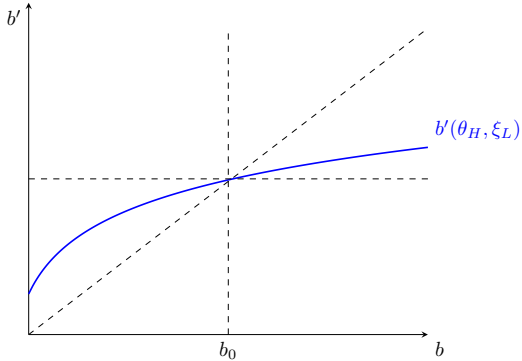
  - **Incentive wedge** $\left|\frac{\partial J}{\partial b'}\right|\geq 0$
  - $\left|\frac{\partial J}{\partial b'}\right|$ zero in Ramsey outcome

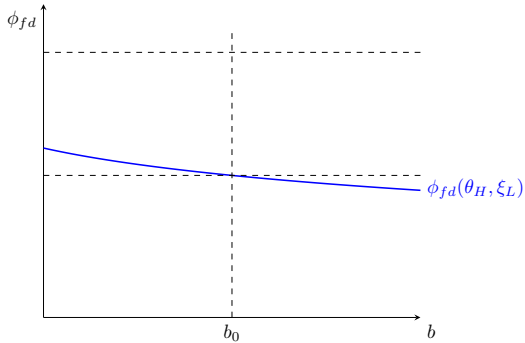
- Reduce debt issuance to incentivize next period gov't to
  - respect target more often
  - set higher ϕ_{fd} in case of switch to fiscal dominance

- Incentive to reduce debt are smaller if ξ' is large

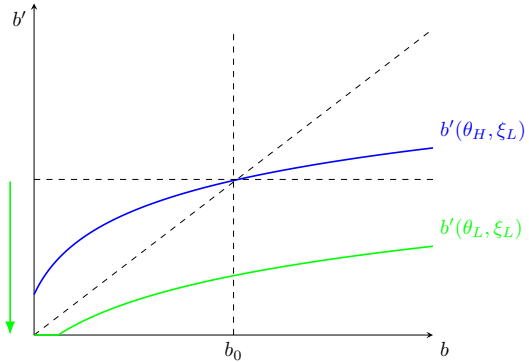
Two types of disinflations

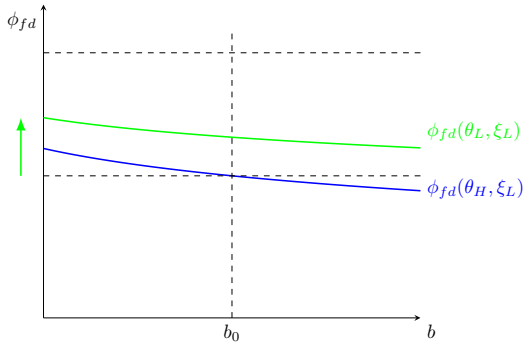
Dynamics





Fundamental disinflation: $\theta_H \to \theta_L$





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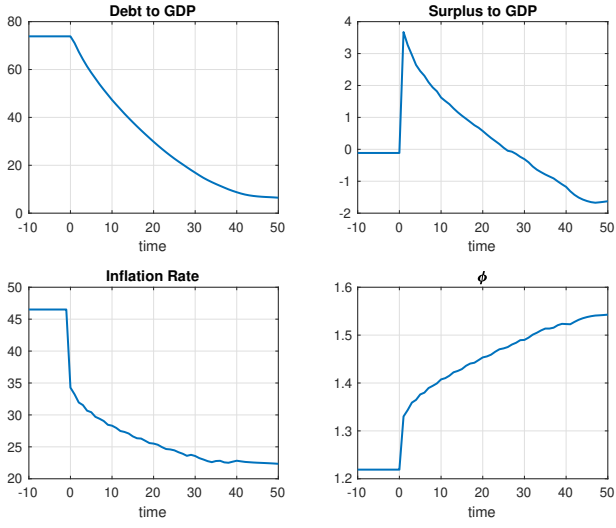
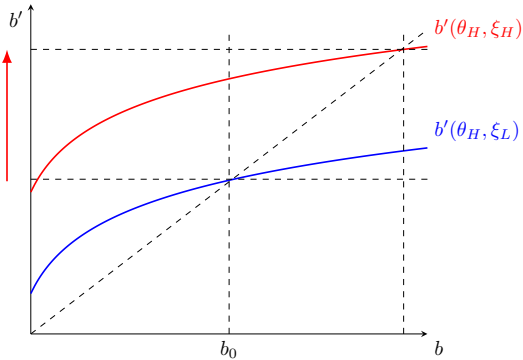
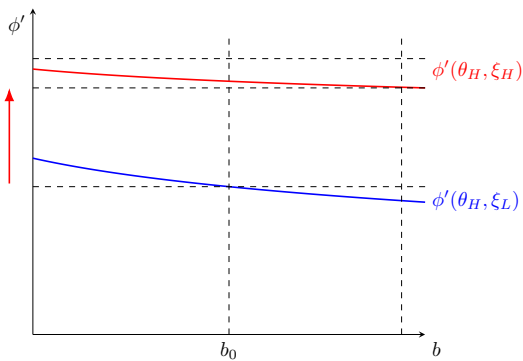


Institutional disinflation: $\xi_L \to \xi_H$





Institutional disinflation: $\xi_L \to \xi_H$

Debt goes up because

- Reduction in incentive wedge, $\left|\frac{\partial J}{\partial b'}\right|$

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

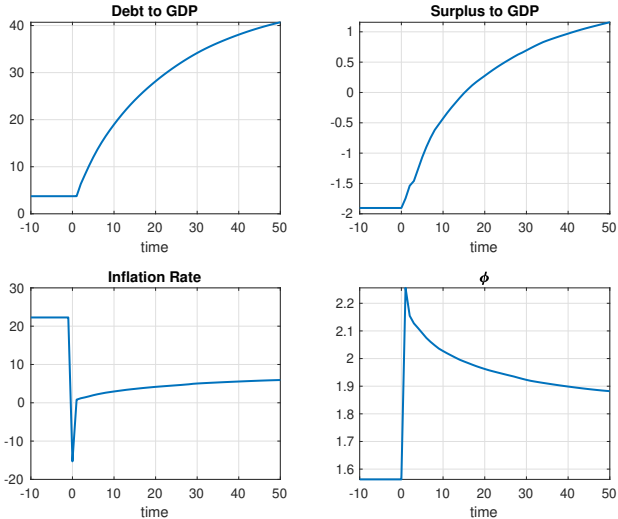
- Increase in real value of gov't liabilities, $b+\phi$, and reduction in seigniorage revenues, $\beta E[v'(\phi')\phi']$

$$b+\phi=\Delta+\beta(b'+\phi')+\beta E[v'(\phi')\phi']$$

Inflation target goes down (ϕ' goes up) because

- Smaller need to induce future gov't to satisfy target

Institutional disinflation: $\xi_L \to \xi_H$



Debt

Taking stock

- Fundamental disinflation
  - Low inflation because low marginal value of public spending
  - Associated with declining path of public debt
- Institutional disinflation
  - Low inflation because increase in cost of interfering with monetary policy
  - Associated with rising path of public debt
- The converse is also true
  - If high value of public spending, then high inflation and increasing path of debt
  - If credibility is lost, then high inflation and declining path of debt

Quantifying role of fundamentals and institutions

Fundamentals vs. institutions

- Calibrate model to match $\pi_t, \Delta_t, B_t/Y_t$ from LATAM economies (1960-2017)
- Use a particle filter to find shocks $\{\xi_t, \theta_t\}$ that fit the data
- Quantify role of fundamentals and institutions
- Measure of credibility: $E(\eta')$

Fundamentals vs. institutions

- Calibrate model to match $\pi_t, \Delta_t, B_t/Y_t$ from LATAM economies (1960-2017)
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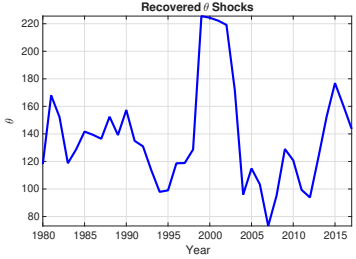
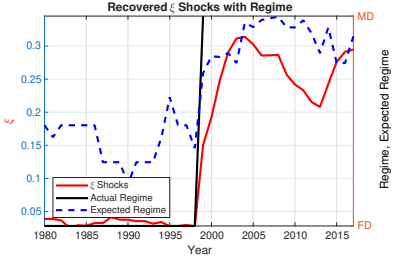
- Quantify role of fundamentals and institutions
- Measure of credibility: $E(\eta')$
- Consider some case studies
  - Colombia
  - Chile
  - US, Italy (separate calibrations)

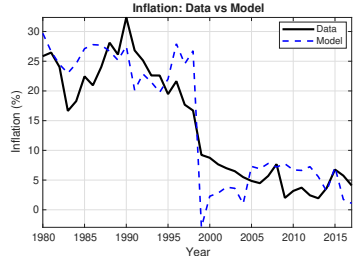
Colombia

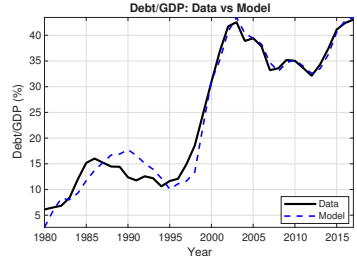
- 1971-1990: High inflation period in which CB financed govt expenditures
- 1991: New Colombian constitution enshrined CB independence
  - Seigniorage financing restricted

Colombia

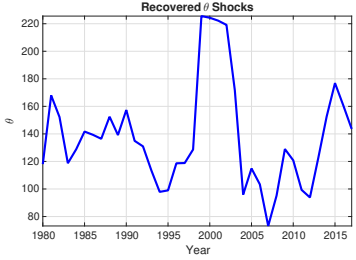

Recovered θ Shocks
θ
Year

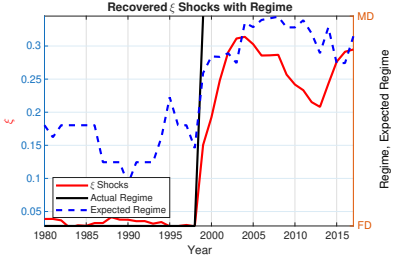

Recovered ξ Shocks with Regime
ξ
ξ Shocks
Actual Regime
Expected Regime
MD
FD
Regime, Expected Regime
Year

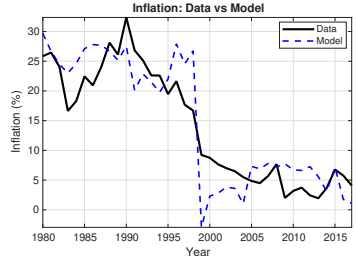

Inflation: Data vs Model
Data
Model
Inflation (%)
Year

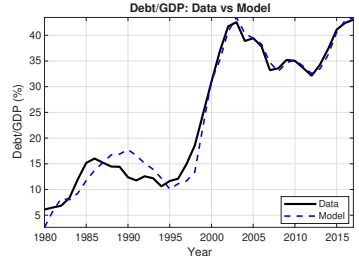

Debt/GDP: Data vs Model
Data
Model
Debt/GDP (%)
Year

Colombia



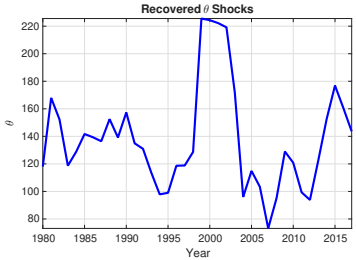


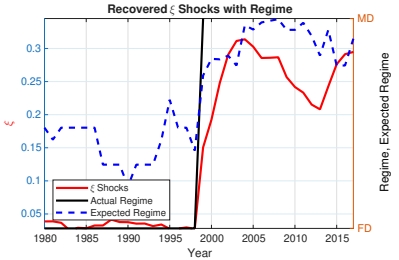


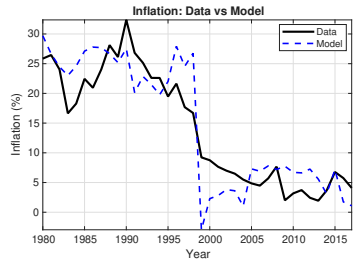


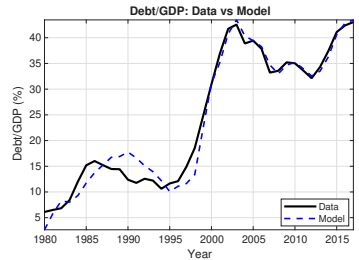
Reduction in inflation 1990-1996 due to lower θ

Colombia



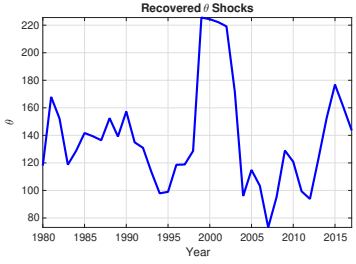


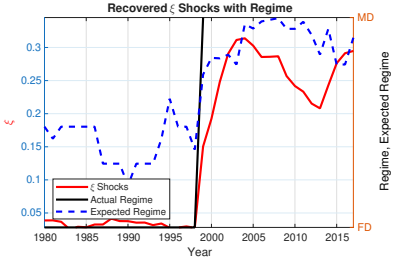


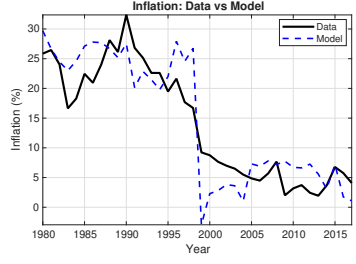


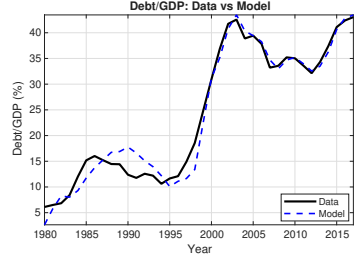
Reduction in inflation post 1998 due to high ξ (and increasing θ)

Colombia



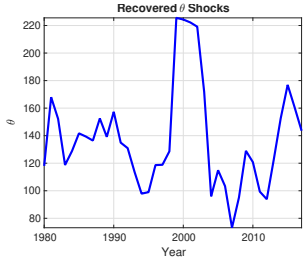


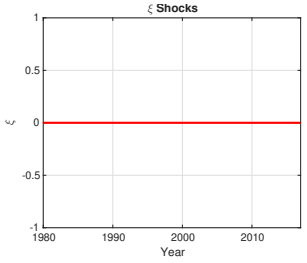


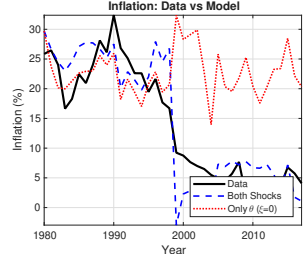


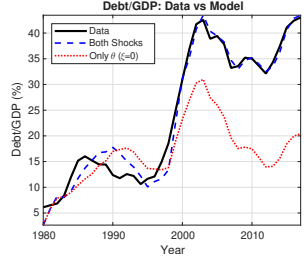
Credible monetary dominant regime only post 1998 while reform in 1991 Target

Colombia- Decomposition



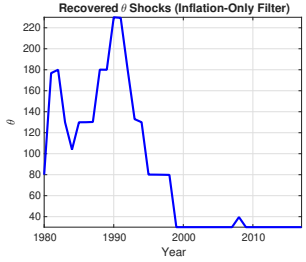


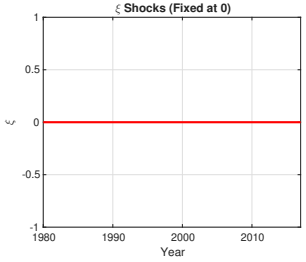


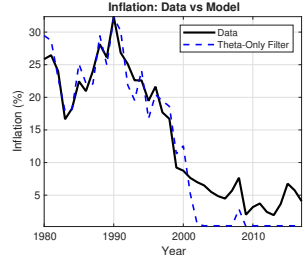


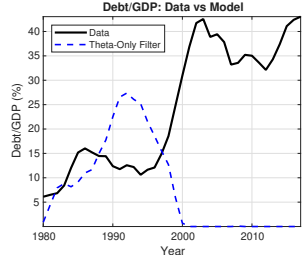
If only θ_t ($\xi_t = 0$): cannot account for drop in inflation post 1998

Colombia- Counterfactual



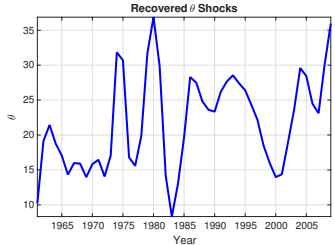


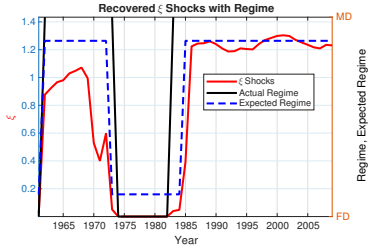


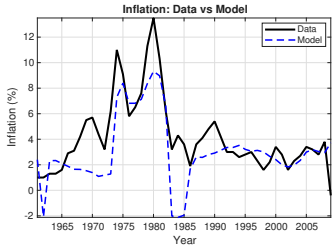


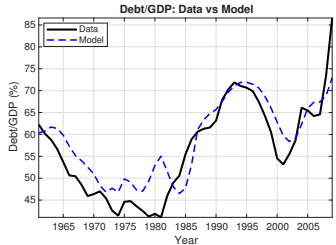
Possible to find path of θ that matches inflation when $\xi = 0$

United States









Decline in credibility in the 70s followed by an increase in 1981

Conclusion

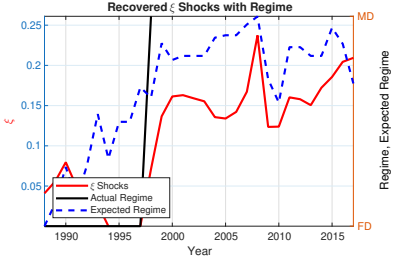
- Theory of endogenous fluctuations between fiscal and monetary dominance
- Successful disinflationary episodes can be driven by
  - Fundamentals
  - Credible institutions
- Different implications for debt and inflation dynamics
- Use this insight to
  - Account for determinants of disinflations
  - Measure of credibility of delegation to independent central bank
- High credibility necessary to support high debt with low inflation

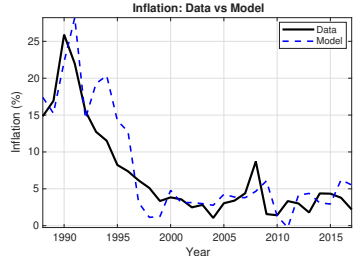
Additional slides

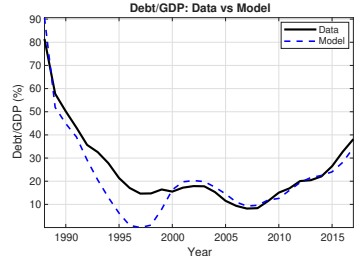
Chile

- 1970s–1980s: Recurrent high inflation episodes
- 1989–1990: Central Bank granted independence with a focus on price stability
- 1990s: Sustained fiscal surpluses and reduced public debt

Chile

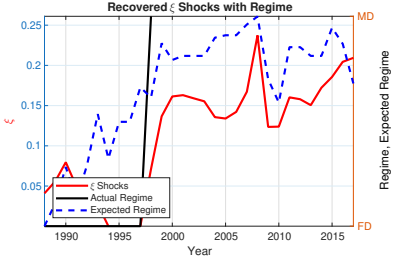


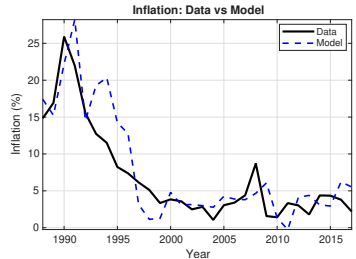


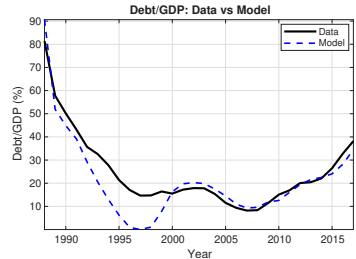


Both inflation and debt-to-GDP fall: increase in credibility not necessary initially

Chile

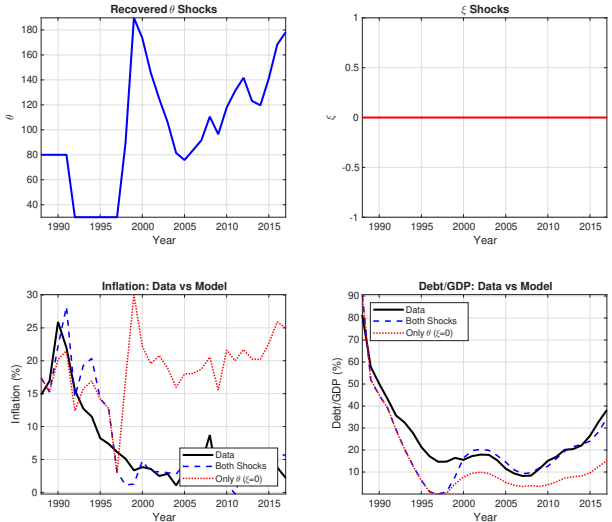






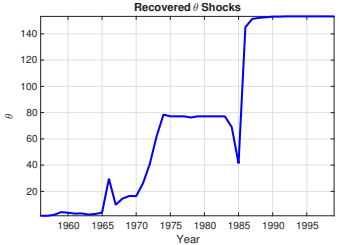
High credibility in late 1990s as debt-to-GDP stable and inflation keeps falling

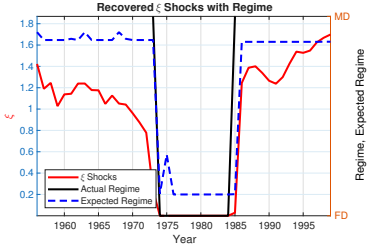
Chile- Decomposition

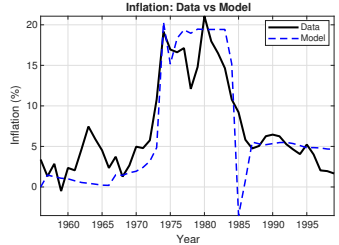


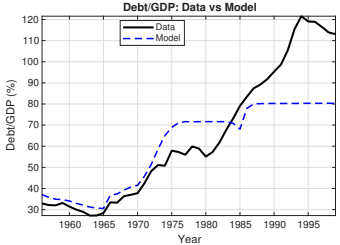
If only θ_t $(\xi_t = 0)$: Inflation much higher in late 1990s

Italy









Central bank independence in 1981

Ramsey problem

From period 1 onwards

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

subject to

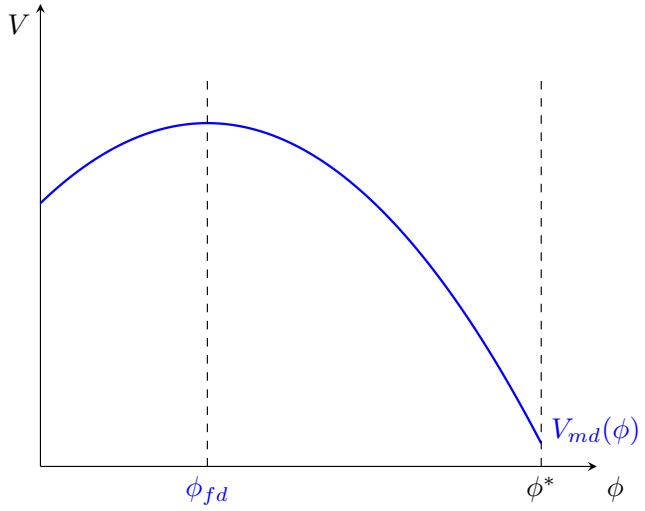
$$\Delta = b + \phi - \beta b' - \beta \sum_{s'} \Pr\left(s'|s\right) H\left(\phi'\left(s'\right)\right)$$

In period 0

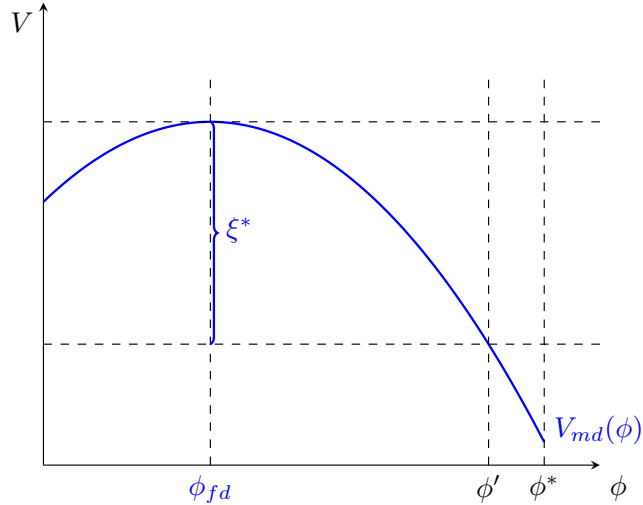
$$\phi_0 = \arg\max_{\phi} V_R(b_0,\phi,s_0)$$

Back

Credibility of mandates



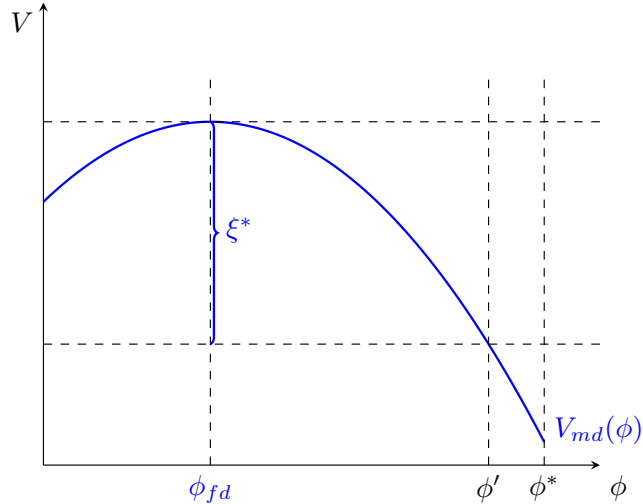
Credibility of mandates



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

Less ambitious target $\rightarrow$ higher credibility

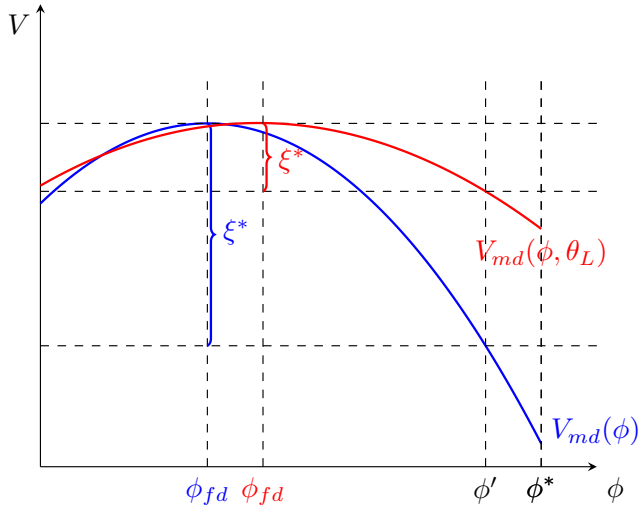
Credibility of mandates



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

Higher (expected) cost $\rightarrow$ higher credibility

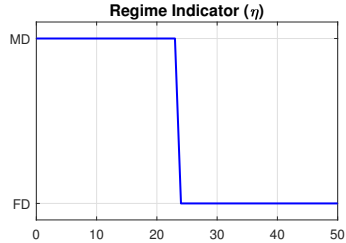
Credibility of mandates

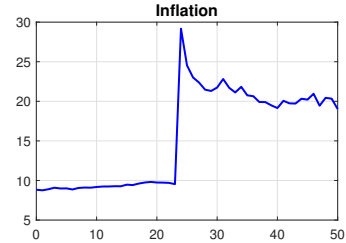


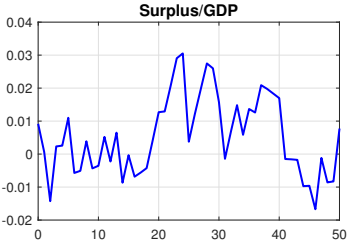
If $\theta \downarrow$ (or $b \downarrow$) then more likely to satisfy target

Back

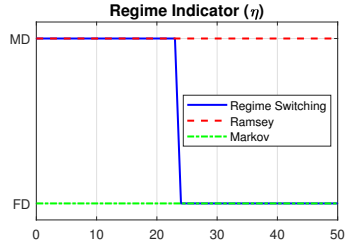
Typical dynamics

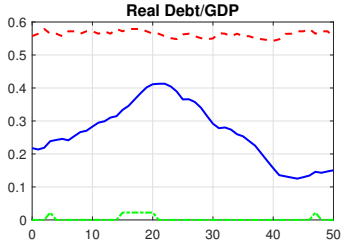


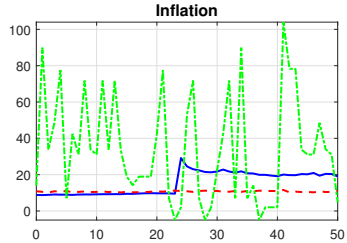


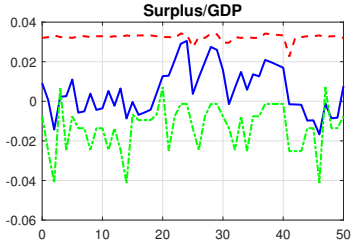


Comparison between models









High ξ necessary for low inflation and high debt

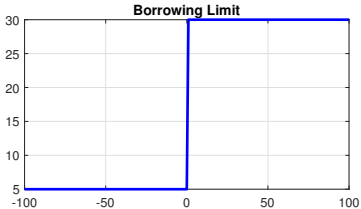
Alternative theory:

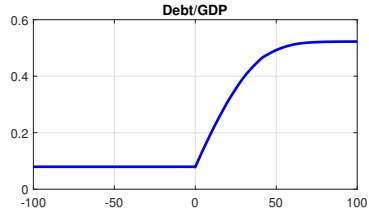
- Government cannot access capital markets, $b' \leq \chi$ w/ χ small
- Then it relies on inflation tax as a substitute
- Thus, low debt and high inflation

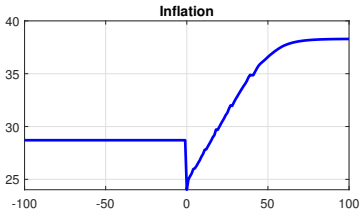
Can a relaxation of the debt limit deliver high debt and low inflation? Not for long

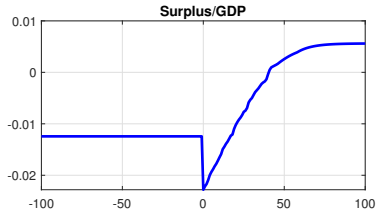
- Initially, government can borrow more so lower surpluses and less inflation
- But as debt increases then ϕ_t decreases and inflation must go up
- Positive comovement between debt and inflation is only temporary
- Eventually high debt and high inflation

Relaxation of debt limits









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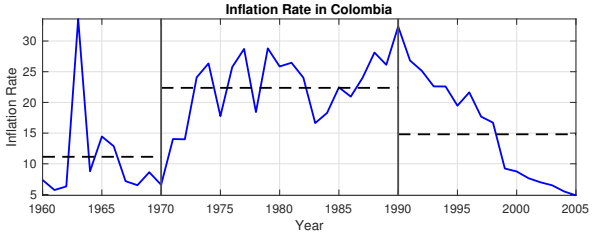
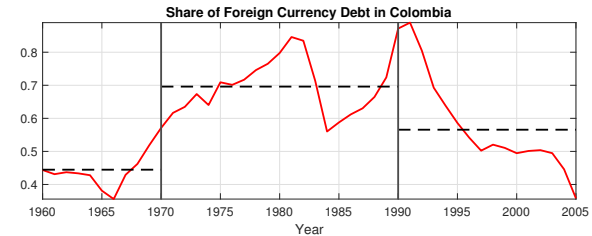
Inflation and foreign currency debt in Colombia





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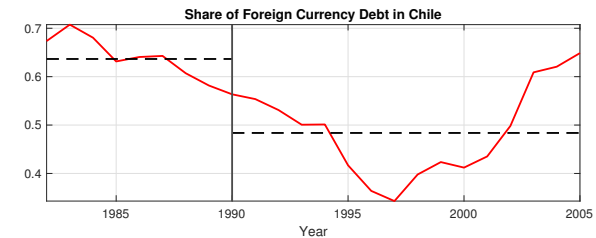
Inflation and foreign currency debt in Chile



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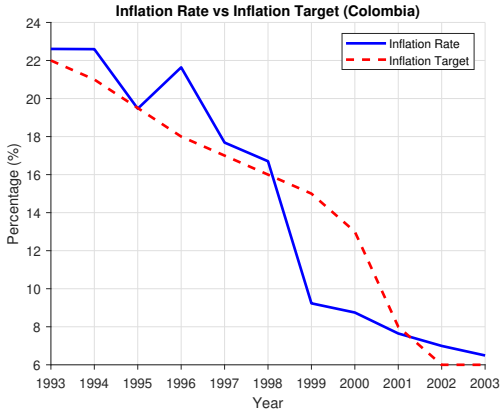
Calibration

- Let $U(C, L, m, G) = C - \chi \frac{L^{1+\psi}}{1+\psi} + \kappa m - \eta m^2 + \theta \frac{G_t^{1-\sigma}}{1-\sigma}$
- Fix $\psi = 1$, $\sigma = 2$, $\beta = .95$
- Calibrate χ, η, $\hat{\beta}$, κ, processes for θ and ξ to hit the following targets:

	Data	Model
Avg. inflation in Q1	3.40	2.1
Avg. inflation in Q4	57.00	54.35
Prob. of staying in Q1	0.69	0.26
Prob. of staying in Q4	0.77	0.53
Average debt-to-gdp	35.38	31.34
Average real money balances	9.89	7.47
Variance of primary surplus	10.68	10.41
Autocorr. of primary surplus	0.67	0.50
Average primary surplus	0.42	0.53

Colombia – Inflation vs. inflation target



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