Implicit Fiscal Guarantee for Monetary Stability

Gaetano GABALLO

Banque de France
Paris School of Economics
CEPR

Eric MENGUS

HEC Paris

Money in the Digitale Age
Helsinki, 12 June 2018

The views expressed here do not necessarily reflect the ones of Banque de France or the Eurosystem.

Motivation

Currency areas and fiscal jurisdictions

Motivation

Currency areas and fiscal jurisdictions

Cryptocurrencies as decentralized payment systems

Motivation

Currency areas and fiscal jurisdictions

Cryptocurrencies as decentralized payment systems

- Does a sustainable monetary system need a fiscal authority?
- Could a truly private monetary system exist?

Motivation

Currency areas and fiscal jurisdictions

Cryptocurrencies as decentralized payment systems

- Does a sustainable monetary system need a fiscal authority?
- Could a truly private monetary system exist?

Current literature (extreme redux):

Motivation

Currency areas and fiscal jurisdictions

Cryptocurrencies as decentralized payment systems

- Does a sustainable monetary system need a fiscal authority?
- Could a truly private monetary system exist?

Current literature (extreme redux):

- Sargent & Wallace (1981) fiscal authority must be passive

Motivation

Currency areas and fiscal jurisdictions

Cryptocurrencies as decentralized payment systems

- Does a sustainable monetary system need a fiscal authority?
- Could a truly private monetary system exist?

Current literature (extreme redux):

- Sargent & Wallace (1981) fiscal authority must be passive
  - governments are a danger

Motivation

Currency areas and fiscal jurisdictions

Cryptocurrencies as decentralized payment systems

- Does a sustainable monetary system need a fiscal authority?
- Could a truly private monetary system exist?

Current literature (extreme redux):

- Sargent & Wallace (1981) fiscal authority must be passive
  - governments are a danger
- Obstelf & Rogoff (1983,2017): tiny probabilistic redemption works

Motivation

Currency areas and fiscal jurisdictions

Cryptocurrencies as decentralized payment systems

- Does a sustainable monetary system need a fiscal authority?
- Could a truly private monetary system exist?

Current literature (extreme redux):

- Sargent & Wallace (1981) fiscal authority must be passive
  - governments are a danger
- Obstelf & Rogoff (1983,2017): tiny probabilistic redemption works
  - $\frac{M}{P_t} > \epsilon$ for each t:

Motivation

Currency areas and fiscal jurisdictions

Cryptocurrencies as decentralized payment systems

- Does a sustainable monetary system need a fiscal authority?
- Could a truly private monetary system exist?

Current literature (extreme redux):

- Sargent & Wallace (1981) fiscal authority must be passive
  - governments are a danger
- Obstelf & Rogoff (1983,2017): tiny probabilistic redemption works
  - $\frac{M}{P_t} > \epsilon$ for each t: I could do the job!

Motivation

Currency areas and fiscal jurisdictions

Cryptocurrencies as decentralized payment systems

- Does a sustainable monetary system need a fiscal authority?
- Could a truly private monetary system exist?

Current literature (extreme redux):

- Sargent & Wallace (1981) fiscal authority must be passive
  - governments are a danger
- Obstelf & Rogoff (1983,2017): tiny probabilistic redemption works
  - $\frac{M}{P_t} > \epsilon$ for each t: I could do the job!

Both arguments based on exogenously fixed actions (commitment).

This paper: model & results

Samuelson (1956) model of fiat money

This paper: model & results

Samuelson (1956) model of fiat money + an authority who

- cares about consumption: its own + people alive
- can tax the real endowment of the young (lump sum)
- can exchange money for real goods

This paper: model & results

Samuelson (1956) model of fiat money + an authority who

- cares about consumption: its own + people alive
- can tax the real endowment of the young (lump sum)
- can exchange money for real goods

we compute the optimal time-consistent policy

This paper: model & results

Samuelson (1956) model of fiat money + an authority who

- cares about consumption: its own + people alive
- can tax the real endowment of the young (lump sum)
- can exchange money for real goods

we compute the optimal time-consistent policy

I. With contingent taxes hyperinflations and autarky are ruled out

This paper: model & results

Samuelson (1956) model of fiat money + an authority who

- cares about consumption: its own + people alive
- can tax the real endowment of the young (lump sum)
- can exchange money for real goods

we compute the optimal time-consistent policy

I. With contingent taxes hyperinflations and autarky are ruled out

- efficient monetary equilibrium is the unique equilibrium

This paper: model & results

Samuelson (1956) model of fiat money + an authority who

- cares about consumption: its own + people alive
- can tax the real endowment of the young (lump sum)
- can exchange money for real goods

we compute the optimal time-consistent policy

I. With contingent taxes hyperinflations and autarky are ruled out

- efficient monetary equilibrium is the unique equilibrium
- no matter the degree of benevolence (can be arbitrarily small!)

This paper: model & results

Samuelson (1956) model of fiat money + an authority who

- cares about consumption: its own + people alive
- can tax the real endowment of the young (lump sum)
- can exchange money for real goods

we compute the optimal time-consistent policy

I. With contingent taxes hyperinflations and autarky are ruled out

- efficient monetary equilibrium is the unique equilibrium
- no matter the degree of benevolence (can be arbitrarily small!)

II. Otherwise the authority's endowed/benevolence must be high

This paper: model & results

Samuelson (1956) model of fiat money + an authority who

- cares about consumption: its own + people alive
- can tax the real endowment of the young (lump sum)
- can exchange money for real goods

we compute the optimal time-consistent policy

I. With contingent taxes hyperinflations and autarky are ruled out

- efficient monetary equilibrium is the unique equilibrium
- no matter the degree of benevolence (can be arbitrarily small!)

II. Otherwise the authority's endowed/benevolence must be high

- with moderate endowment/benevolence: autarky ruled out

This paper: model & results

Samuelson (1956) model of fiat money + an authority who

- cares about consumption: its own + people alive
- can tax the real endowment of the young (lump sum)
- can exchange money for real goods

we compute the optimal time-consistent policy

I. With contingent taxes hyperinflations and autarky are ruled out

- efficient monetary equilibrium is the unique equilibrium
- no matter the degree of benevolence (can be arbitrarily small!)

II. Otherwise the authority's endowed/benevolence must be high

- with moderate endowment/benevolence: autarky ruled out

  ...but unique or multiple inefficient monetary equilibria!

This paper: model & results

Samuelson (1956) model of fiat money + an authority who

- cares about consumption: its own + people alive
- can tax the real endowment of the young (lump sum)
- can exchange money for real goods

we compute the optimal time-consistent policy

I. With contingent taxes hyperinflations and autarky are ruled out

- efficient monetary equilibrium is the unique equilibrium
- no matter the degree of benevolence (can be arbitrarily small!)

II. Otherwise the authority's endowed/benevolence must be high

- with moderate endowment/benevolence: autarky ruled out
  ...but unique or multiple inefficient monetary equilibria!
- with low endowment/benevolence autarky is still possible

This paper: broad ideas

Monetary stability relies on implicit fiscal guarantee

This paper: broad ideas

Monetary stability relies on implicit fiscal guarantee

- fiscal policy has **off-equilibrium** **active** role

This paper: broad ideas

Monetary stability relies on implicit fiscal guarantee

- fiscal policy has **off-equilibrium active** role
  - $\approx$ whatever it takes effect...

This paper: broad ideas

Monetary stability relies on implicit fiscal guarantee

- fiscal policy has **off-equilibrium active** role
  - $\approx$ whatever it takes effect...
- **the possibility to impose state-contingent taxes** is essential

This paper: broad ideas

Monetary stability relies on implicit fiscal guarantee

- fiscal policy has **off-equilibrium active** role
  - ≈ whatever it takes effect...
- **the possibility to impose state-contingent taxes** is essential
  - when commitment is not an option

This paper: broad ideas

Monetary stability relies on implicit fiscal guarantee

- fiscal policy has **off-equilibrium active** role
  - $\approx$ whatever it takes effect...
- **the possibility to impose state-contingent taxes** is essential
  - when commitment is not an option
  - ex-post **the authority could not resist taxing through money**

This paper: broad ideas

Monetary stability relies on implicit fiscal guarantee

- fiscal policy has **off-equilibrium active** role
  - $\approx$ whatever it takes effect...
- **the possibility to impose state-contingent taxes** is essential
  - when commitment is not an option
  - ex-post **the authority could not resist taxing through money**

Implications for cryptocurrencies:

- Cryptocurrencies, without fiscal support, cannot survive to a crisis...

This paper: broad ideas

Monetary stability relies on implicit fiscal guarantee

- fiscal policy has **off-equilibrium active** role
  - $\approx$ whatever it takes effect...
- **the possibility to impose state-contingent taxes** is essential
  - when commitment is not an option
  - ex-post **the authority could not resist taxing through money**

Implications for cryptocurrencies:

- Cryptocurrencies, without fiscal support, cannot survive to a crisis...
- ...unless it becomes "too big to fail"

This paper: broad ideas

Monetary stability relies on implicit fiscal guarantee

- fiscal policy has **off-equilibrium active** role
  - $\approx$ whatever it takes effect...
- **the possibility to impose state-contingent taxes** is essential
  - when commitment is not an option
  - ex-post **the authority could not resist taxing through money**

Implications for cryptocurrencies:

- Cryptocurrencies, without fiscal support, cannot survive to a crisis...
- ...unless it becomes "too big to fail"
- in this case, an authority could hardly resist fiscal intervention

This paper: broad ideas

Monetary stability relies on implicit fiscal guarantee

- fiscal policy has **off-equilibrium active** role
  - $\approx$ whatever it takes effect...
- **the possibility to impose state-contingent taxes** is essential
  - when commitment is not an option
  - ex-post **the authority could not resist taxing through money**

Implications for cryptocurrencies:

- Cryptocurrencies, without fiscal support, cannot survive to a crisis...
- ...unless it becomes "too big to fail"
- in this case, an authority could hardly resist fiscal intervention

  - *QE on toxic assets, why not on cryptocurrencies in the future?*

This paper: broad ideas

Monetary stability relies on implicit fiscal guarantee

- fiscal policy has **off-equilibrium active** role
  - $\approx$ whatever it takes effect...
- **the possibility to impose state-contingent taxes** is essential
  - when commitment is not an option
  - ex-post **the authority could not resist taxing through money**

Implications for cryptocurrencies:

- Cryptocurrencies, without fiscal support, cannot survive to a crisis...
- ...unless it becomes "too big to fail"
- in this case, an authority could hardly resist fiscal intervention

  - *QE on toxic assets, why not on cryptocurrencies in the future?*

1. Basic model

OLG Model: consumption-saving problem

- A representative agent born at time t maximizes:

$$U_t \equiv \log(C_{t,y}) + \log(C_{t+1,o})$$

OLG Model: consumption-saving problem

- A representative agent born at time t maximizes:

$$U_t \equiv \log(C_{t,y}) + \log(C_{t+1,o})$$

- subject to:

$$\begin{aligned} young: \quad & C_{t,y} + \frac{M_t}{P_t} + S_t + T_{t,y} = W \\ old: \quad & C_{t,o} = \frac{M_{t-1}}{P_t} + \theta S_{t-1} + T_{t,o} \end{aligned}$$

where:

OLG Model: consumption-saving problem

- A representative agent born at time t maximizes:

$$U_t \equiv \log(C_{t,y}) + \log(C_{t+1,o})$$

- subject to:

$$\begin{aligned} young: \quad & C_{t,y} + \frac{M_t}{P_t} + S_t + T_{t,y} = W \\ old: \quad & C_{t,o} = \frac{M_{t-1}}{P_t} + \theta S_{t-1} + T_{t,o} \end{aligned}$$

where:

  - individual endowment W, lump sum tax T;

OLG Model: consumption-saving problem

- A representative agent born at time t maximizes:

$$U_t \equiv \log(C_{t,y}) + \log(C_{t+1,o})$$

- subject to:

$$\begin{aligned} \textit{young}: \quad & C_{t,y} + \frac{M_t}{P_t} + S_t + T_{t,y} = W \\ \textit{old}: \quad & C_{t,o} = \frac{M_{t-1}}{P_t} + \theta S_{t-1} + T_{t,o} \end{aligned}$$

where:

  - individual endowment W, lump sum tax T;
  - agents choose consumption C and composition of savings:

OLG Model: consumption-saving problem

- A representative agent born at time t maximizes:

$$U_t \equiv \log(C_{t,y}) + \log(C_{t+1,o})$$

- subject to:

$$\begin{aligned} \textit{young}: \quad & C_{t,y} + \frac{M_t}{P_t} + S_t + T_{t,y} = W \\ \textit{old}: \quad & C_{t,o} = \frac{M_{t-1}}{P_t} + \theta S_{t-1} + T_{t,o} \end{aligned}$$

where:

- individual endowment W, lump sum tax T;
- agents choose consumption C and composition of savings:
- either in real cash holdings M/P

OLG Model: consumption-saving problem

- A representative agent born at time t maximizes:

$$U_t \equiv \log(C_{t,y}) + \log(C_{t+1,o})$$

- subject to:

$$\begin{aligned} \textit{young}: \quad & C_{t,y} + \frac{M_t}{P_t} + S_t + T_{t,y} = W \\ \textit{old}: \quad & C_{t,o} = \frac{M_{t-1}}{P_t} + \theta S_{t-1} + T_{t,o} \end{aligned}$$

where:

- individual endowment W, lump sum tax T;
- agents choose consumption C and composition of savings:
- either in real cash holdings M/P
- or in freely available storage S with a return $\theta < 1$

Optimal choices of agents

- Savings:

$$D_t \equiv S_t + \frac{M_t}{P_t} = \frac{W}{2}$$

for any expected return (property of log-utility)

$$\rho_t = \frac{\theta S_t + M_t / P_{t+1}}{D_t}$$

Optimal choices of agents

- Savings:
$$D_t \equiv S_t + \frac{M_t}{P_t} = \frac{W}{2}$$
for any expected return (property of log-utility)
$$\rho_t = \frac{\theta S_t + M_t/P_{t+1}}{D_t}$$
- Portfolio allocation:
$$\begin{aligned}
\frac{M_t}{P_t} = \frac{W}{2} \quad &\text{and } S_t = 0 && \text{if} && \Pi_t < \frac{1}{\theta}, \\
\frac{M_t}{P_t} + S_t = \frac{W}{2} \quad & && \text{if} && \Pi_t = \frac{1}{\theta}, \\
S_t = \frac{W}{2} \quad &\text{and } \frac{M_t}{P_t} = 0 && \text{if} && \Pi_t > \frac{1}{\theta},
\end{aligned}$$
where $\Pi_t \equiv P_{t+1}/P_t$ is the inflation rate from time t to time $t+1$.

OLG Model: fiscal authority

- M_t money held by agents, $M_{g,t}$ money held by the authority and

$$M_{g,t} + M_t = \bar{M}$$

with $\bar{M}$ given (e.g. it can be shells or cryptocurrencies).

OLG Model: fiscal authority

- M_t money held by agents, $M_{g,t}$ money held by the authority and

$$M_{g,t} + M_t = \bar{M}$$

with $\bar{M}$ given (e.g. it can be shells or cryptocurrencies).

- The balance sheet of the authority satisfies:

$$T_{t,y} + \frac{M_{g,t-1}}{P_t} = \frac{M_{g,t}}{P_t} + T_{t,o} + G_t.$$

OLG Model: fiscal authority

- M_t money held by agents, $M_{g,t}$ money held by the authority and

$$M_{g,t} + M_t = \bar{M}$$

  with $\bar{M}$ given (e.g. it can be shells or cryptocurrencies).

- The balance sheet of the authority satisfies:

$$T_{t,y} + \frac{M_{g,t-1}}{P_t} = \frac{M_{g,t}}{P_t} + T_{t,o} + G_t.$$

- A policy $\mathcal{P}_t \equiv (T_{t,y}, M_{g,t}, G_t, T_{t,o})$ is a collection of taxes and money purchases that are implemented by the authority at time t

OLG Model: fiscal authority

- M_t money held by agents, $M_{g,t}$ money held by the authority and

$$M_{g,t} + M_t = \bar{M}$$

with $\bar{M}$ given (e.g. it can be shells or cryptocurrencies).

- The balance sheet of the authority satisfies:

$$T_{t,y} + \frac{M_{g,t-1}}{P_t} = \frac{M_{g,t}}{P_t} + T_{t,o} + G_t.$$

- A policy $\mathcal{P}_t \equiv (T_{t,y}, M_{g,t}, G_t, T_{t,o})$ is a collection of taxes and money purchases that are implemented by the authority at time t

- Look first at the no policy case: $\mathcal{P}_t = (0, 0, 0, 0)$ at any t

No policy leads to indeterminacy

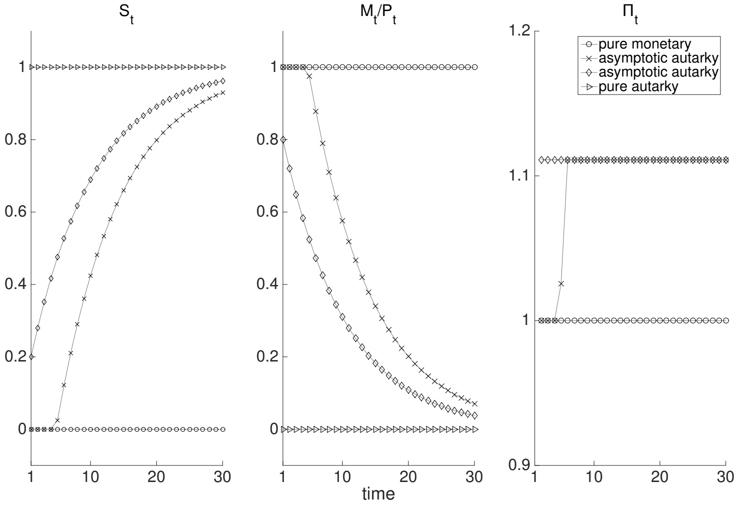

Figure: Equilibria without policy intervention for $\theta = 0.9$, $W = 2$ and $\bar{M} = 1$.

2. Optimal policy with state-contingent taxes

Optimal policy with state-contingent taxes

At any t, an optimal policy is a $\mathcal{P}_t^* = (T_{y,t}^*, M_{g,t}^*, G_t^*, 0)$ that solves:

$$\max_{\mathcal{P}_t, G_t} \{\log C_{y,t} + \log C_{o,t} + \lambda \log G_t\},$$

subject to

$$T_{y,t} + \frac{M_{g,t-1}}{P_t} = \frac{M_{g,t}}{P_t} + G_t$$

Optimal policy with state-contingent taxes

At any t, an optimal policy is a $\mathcal{P}_t^* = (T_{y,t}^*, M_{g,t}^*, G_t^*, 0)$ that solves:

$$\max_{\mathcal{P}_t, G_t} \left\{ \log C_{y,t} + \log C_{o,t} + \lambda \log G_t \right\},$$

subject to

$$T_{y,t} + \frac{M_{g,t-1}}{P_t} = \frac{M_{g,t}}{P_t} + G_t$$

taking into account agents' decision process on consumption:

$$\begin{aligned} C_{y,t} &= \frac{M_t}{P_t} + S_t = \frac{W - T_{y,t}}{2} \\ C_{o,t} &= \frac{M_{t-1}}{P_t} + \theta S_{t-1} \end{aligned}$$

and market clearing conditions, with $S_0 = 0$ and $M_0 \leq \bar{M}$.

Optimal policy with state-contingent taxes

At any t, an optimal policy is a $\mathcal{P}_t^* = (T_{y,t}^*, M_{g,t}^*, G_t^*, 0)$ that solves:

$$\max_{\mathcal{P}_t, G_t} \{\log C_{y,t} + \log C_{o,t} + \lambda \log G_t\},$$

subject to

$$T_{y,t} + \frac{M_{g,t-1}}{P_t} = \frac{M_{g,t}}{P_t} + G_t$$

taking into account agents' decision process on consumption:

$$\begin{aligned} C_{y,t} &= \frac{M_t}{P_t} + S_t = \frac{W - T_{y,t}}{2} \\ C_{o,t} &= \frac{M_{t-1}}{P_t} + \theta S_{t-1} \end{aligned}$$

and market clearing conditions, with $S_0 = 0$ and $M_0 \leq \bar{M}$.

- no transfers to old: optimal with heterogeneity in the absence of type-specific fiscal tools!

Optimal policy with state-contingent taxes

We can rewrite the problem of the authority as

$$\max_{\mathcal{P}_t, G_t} \left\{ \log \underbrace{\left(W - G_t - \frac{M_{t-1}}{P_t} - S_t \right)}_{=C_{y,t}} + \log \underbrace{\left(\frac{M_{t-1}}{P_t} + \theta S_{t-1} \right)}_{=C_{o,t}} + \lambda \log G_t \right\}$$

Optimal policy with state-contingent taxes

We can rewrite the problem of the authority as

$$\max_{\mathcal{P}_t, G_t} \left\{ \log \underbrace{\left(W - G_t - \frac{M_{t-1}}{P_t} - S_t \right)}_{=C_{y,t}} + \log \underbrace{\left(\frac{M_{t-1}}{P_t} + \theta S_{t-1} \right)}_{=C_{o,t}} + \lambda \log G_t \right\}$$

whose solution is

$$\begin{cases} G_t = \lambda C_{y,t}, \;\; P_t = \frac{(2+\lambda)M_{t-1}}{W-(1+\lambda)\theta S_{t-1} - S_t} & \text{with} \quad C_{y,t} \geq C_{o,t} \\ G_t = \lambda C_{y,t}, \;\; P_t \to \infty & \text{otherwise.} \end{cases}$$

Optimal policy with state-contingent taxes

We can rewrite the problem of the authority as

$$\max_{\mathcal{P}_t, G_t} \left\{ \log \underbrace{\left(W - G_t - \frac{M_{t-1}}{P_t} - S_t \right)}_{=C_{y,t}} + \log \underbrace{\left(\frac{M_{t-1}}{P_t} + \theta S_{t-1} \right)}_{=C_{o,t}} + \lambda \log G_t \right\}$$

whose solution is

$$\begin{cases} G_t = \lambda C_{y,t}, \;\; P_t = \frac{(2+\lambda)M_{t-1}}{W-(1+\lambda)\theta S_{t-1} - S_t} & \text{with} \quad C_{y,t} \geq C_{o,t} \\ G_t = \lambda C_{y,t}, \;\; P_t \to \infty & \text{otherwise.} \end{cases}$$

The authority likes consumption equality $\rightarrow$ **it fights** inflation!

Optimal policy with state-contingent taxes

We can rewrite the problem of the authority as

$$\max_{\mathcal{P}_t, G_t} \left\{ \log \underbrace{\left(W - G_t - \frac{M_{t-1}}{P_t} - S_t \right)}_{=C_{y,t}} + \log \underbrace{\left(\frac{M_{t-1}}{P_t} + \theta S_{t-1} \right)}_{=C_{o,t}} + \lambda \log G_t \right\}$$

whose solution is

$$\begin{cases} G_t = \lambda C_{y,t}, \;\; P_t = \frac{(2+\lambda)M_{t-1}}{W-(1+\lambda)\theta S_{t-1} - S_t} & \text{with} \quad C_{y,t} \geq C_{o,t} \\ G_t = \lambda C_{y,t}, \;\; P_t \to \infty & \text{otherwise.} \end{cases}$$

The authority likes consumption equality $\rightarrow$ **it fights** inflation!

- *more* storage is needed for the same inflation rate
- At some point this is unfeasible: no asymptotic autarky!

Optimal policy with state-contingent taxes

We can rewrite the problem of the authority as

$$\max_{\mathcal{P}_t, G_t} \left\{ \log \underbrace{\left(W - G_t - \frac{M_{t-1}}{P_t} - S_t \right)}_{=C_{y,t}} + \log \underbrace{\left(\frac{M_{t-1}}{P_t} + \theta S_{t-1} \right)}_{=C_{o,t}} + \lambda \log G_t \right\}$$

whose solution is

$$\begin{cases} G_t = \lambda C_{y,t}, \;\; P_t = \frac{(2+\lambda)M_{t-1}}{W-(1+\lambda)\theta S_{t-1} - S_t} & \text{with} \quad C_{y,t} \geq C_{o,t} \\ G_t = \lambda C_{y,t}, \;\; P_t \to \infty & \text{otherwise.} \end{cases}$$

The authority likes consumption equality $\rightarrow$ **it fights** inflation!

- *more* storage is needed for the same inflation rate
- At some point this is unfeasible: no asymptotic autarky!

As $M_{t-1} \to 0$, then $P_t \to 0^+$: deflation is time-consistent!

Optimal policy with state-contingent taxes

We can rewrite the problem of the authority as

$$\max_{\mathcal{P}_t, G_t} \left\{ \log \underbrace{\left(W - G_t - \frac{M_{t-1}}{P_t} - S_t \right)}_{=C_{y,t}} + \log \underbrace{\left(\frac{M_{t-1}}{P_t} + \theta S_{t-1} \right)}_{=C_{o,t}} + \lambda \log G_t \right\}$$

whose solution is

$$\begin{cases} G_t = \lambda C_{y,t}, \;\; P_t = \frac{(2+\lambda)M_{t-1}}{W-(1+\lambda)\theta S_{t-1} - S_t} & \text{with} \quad C_{y,t} \geq C_{o,t} \\ G_t = \lambda C_{y,t}, \;\; P_t \to \infty & \text{otherwise.} \end{cases}$$

The authority likes consumption equality $\rightarrow$ **it fights** inflation!

- *more* storage is needed for the same inflation rate
- At some point this is unfeasible: no asymptotic autarky!

As $M_{t-1} \to 0$, then $P_t \to 0^+$: deflation is time-consistent!

- Autarky cannot be an equilibrium!

Optimal policy with state-contingent taxes

compare

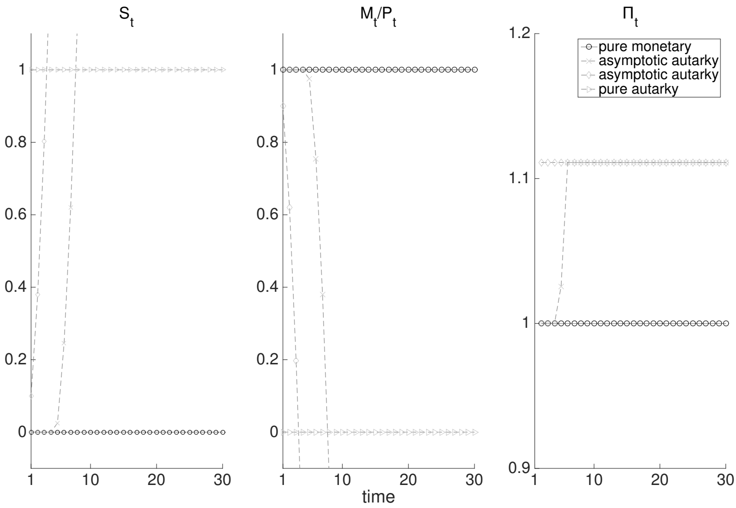

Figure: Uniqueness with optimal policy for $\theta = 0.9$, $W = 2$, $\bar{M} = 1$ and $\lambda \to 0$.

3. Optimal policy **without** state-contingent taxes

Optimal policy without state-contingent taxes

At any t, an optimal policy is a $\mathcal{P}_t^* = (\bar{T}, M_{g,t}^*, G_t^*, 0)$ that solves:

$$\max_{M_{g,t}, G_t} \{\log C_{y,t} + \log C_{o,t} + \lambda \log G_t\},$$

subject to

$$\bar{T} + \frac{M_{g,t-1}}{P_t} = \frac{M_{g,t}}{P_t} + G_t$$

Optimal policy without state-contingent taxes

At any t, an optimal policy is a $\mathcal{P}_t^* = (\bar{T}, M_{g,t}^*, G_t^*, 0)$ that solves:

$$\max_{M_{g,t}, G_t} \{\log C_{y,t} + \log C_{o,t} + \lambda \log G_t\},$$

subject to

$$\bar{T} + \frac{M_{g,t-1}}{P_t} = \frac{M_{g,t}}{P_t} + G_t$$

taking into account agents' decision process on consumption:

$$C_{y,t} = \frac{M_t}{P_t} + S_t = \frac{W - \bar{T}}{2} \text{ and } C_{o,t} = \frac{M_{t-1}}{P_t} + \theta S_{t-1}$$

and market clearing conditions, with $S_0 = 0$ and $M_0 \leq \bar{M}$.

Optimal policy without state-contingent taxes

At any t, an optimal policy is a $\mathcal{P}_t^* = (\bar{T}, M_{g,t}^*, G_t^*, 0)$ that solves:

$$\max_{M_{g,t}, G_t} \{\log C_{y,t} + \log C_{o,t} + \lambda \log G_t\},$$

subject to

$$\bar{T} + \frac{M_{g,t-1}}{P_t} = \frac{M_{g,t}}{P_t} + G_t$$

taking into account agents' decision process on consumption:

$$C_{y,t} = \frac{M_t}{P_t} + S_t = \frac{W - \bar{T}}{2} \text{ and } C_{o,t} = \frac{M_{t-1}}{P_t} + \theta S_{t-1}$$

and market clearing conditions, with $S_0 = 0$ and $M_0 \leq \bar{M}$.

- Taxes are still there but are now fixed!

Optimal policy without state-contingent taxes

We can then rewrite the problem of the authority as

$$\max_{P_t}\left\{\log\frac{W-\bar{T}}{2}+\log\underbrace{\left(\frac{M_{t-1}}{P_t}+\theta S_{t-1}\right)}_{=C_{o,t}}+\lambda\log\underbrace{\left(\frac{W+\bar{T}}{2}-\frac{M_{t-1}}{P_t}-S_t\right)}_{=G_t}\right\}$$

Optimal policy without state-contingent taxes

We can then rewrite the problem of the authority as

$$\max_{P_t} \left\{ \log \frac{W - \bar{T}}{2} + \log \underbrace{\left(\frac{M_{t-1}}{P_t} + \theta S_{t-1} \right)}_{=C_{o,t}} + \lambda \log \underbrace{\left(\frac{W + \bar{T}}{2} - \frac{M_{t-1}}{P_t} - S_t \right)}_{=G_t} \right\}$$

whose solution is

$$\begin{cases} P_t = \frac{2(1+\lambda)M_{t-1}}{W+\bar{T}-2\lambda\theta S_{t-1}-2S_t} & \text{with} \quad \lambda C_{o,t} \leq G_t \\ P_t \to \infty & \text{otherwise.} \end{cases}$$

Optimal policy without state-contingent taxes

We can then rewrite the problem of the authority as

$$\max_{P_t} \left\{ \log \frac{W - \bar{T}}{2} + \log \underbrace{\left(\frac{M_{t-1}}{P_t} + \theta S_{t-1} \right)}_{=C_{o,t}} + \lambda \log \underbrace{\left(\frac{W + \bar{T}}{2} - \frac{M_{t-1}}{P_t} - S_t \right)}_{=G_t} \right\}$$

whose solution is

$$\begin{cases} P_t = \frac{2(1+\lambda)M_{t-1}}{W+\bar{T}-2\lambda\theta S_{t-1}-2S_t} & \text{with} \quad \lambda C_{o,t} \leq G_t \\ P_t \to \infty & \text{otherwise.} \end{cases}$$

The authority trades-off public and old's cons. $\rightarrow$ **it produces** inflation!

Optimal policy without state-contingent taxes

We can then rewrite the problem of the authority as

$$\max_{P_t} \left\{ \log \frac{W - \bar{T}}{2} + \log \underbrace{\left(\frac{M_{t-1}}{P_t} + \theta S_{t-1} \right)}_{=C_{o,t}} + \lambda \log \underbrace{\left(\frac{W + \bar{T}}{2} - \frac{M_{t-1}}{P_t} - S_t \right)}_{=G_t} \right\}$$

whose solution is

$$\begin{cases} P_t = \frac{2(1+\lambda)M_{t-1}}{W+\bar{T}-2\lambda\theta S_{t-1}-2S_t} & \text{with} \quad \lambda C_{o,t} \leq G_t \\ P_t \to \infty & \text{otherwise.} \end{cases}$$

The authority trades-off public and old's cons. $\rightarrow$ **it produces** inflation!

- *less* storage is needed for the same inflation rate
- With low $\bar{T}$ and high λ: asymptotic storage with money!

Optimal policy without state-contingent taxes

We can then rewrite the problem of the authority as

$$\max_{P_t} \left\{ \log \frac{W - \bar{T}}{2} + \log \underbrace{\left(\frac{M_{t-1}}{P_t} + \theta S_{t-1} \right)}_{=C_{o,t}} + \lambda \log \underbrace{\left(\frac{W + \bar{T}}{2} - \frac{M_{t-1}}{P_t} - S_t \right)}_{=G_t} \right\}$$

whose solution is

$$\begin{cases} P_t = \frac{2(1+\lambda)M_{t-1}}{W+\bar{T}-2\lambda\theta S_{t-1}-2S_t} & \text{with} \quad \lambda C_{o,t} \leq G_t \\ P_t \to \infty & \text{otherwise.} \end{cases}$$

The authority trades-off public and old's cons. $\rightarrow$ **it produces** inflation!

- *less* storage is needed for the same inflation rate
- With low $\bar{T}$ and high λ: asymptotic storage with money!

As $M_{t-1} \to 0$, then $P_t \to \infty$ for lower $\bar{T}$ and higher λ

Optimal policy without state-contingent taxes

We can then rewrite the problem of the authority as

$$\max_{P_t} \left\{ \log \frac{W - \bar{T}}{2} + \log \underbrace{\left(\frac{M_{t-1}}{P_t} + \theta S_{t-1} \right)}_{=C_{o,t}} + \lambda \log \underbrace{\left(\frac{W + \bar{T}}{2} - \frac{M_{t-1}}{P_t} - S_t \right)}_{=G_t} \right\}$$

whose solution is

$$\begin{cases} P_t = \frac{2(1+\lambda) M_{t-1}}{W + \bar{T} - 2\lambda\theta S_{t-1} - 2S_t} & \text{with} \quad \lambda C_{o,t} \leq G_t \\ P_t \to \infty & \text{otherwise.} \end{cases}$$

The authority trades-off public and old's cons. $\rightarrow$ **it produces** inflation!

- *less* storage is needed for the same inflation rate
- With low $\bar{T}$ and high λ: asymptotic storage with money!

As $M_{t-1} \to 0$, then $P_t \to \infty$ for lower $\bar{T}$ and higher λ

- Autarky can be an equilibrium!

Optimal policy without state-contingent taxes

We can then rewrite the problem of the authority as

$$\max_{P_t}\left\{\log\frac{W-\bar{T}}{2}+\log\underbrace{\left(\frac{M_{t-1}}{P_t}+\theta S_{t-1}\right)}_{=C_{o,t}}+\lambda\log\underbrace{\left(\frac{W+\bar{T}}{2}-\frac{M_{t-1}}{P_t}-S_t\right)}_{=G_t}\right\}$$

whose solution is

$$\begin{cases} P_t=\frac{2(1+\lambda)M_{t-1}}{W+\bar{T}-2\lambda\theta S_{t-1}-2S_t} & \text{with} \quad \lambda C_{o,t}\leq G_t \\ P_t\to\infty & \text{otherwise.}\end{cases}$$

The authority trades-off public and old's cons. $\rightarrow$ **it produces** inflation!

- *less* storage is needed for the same inflation rate
- With low $\bar{T}$ and high λ: asymptotic storage with money!

As $M_{t-1}\to 0$, then $P_t\to\infty$ for lower $\bar{T}$ and higher λ

- Autarky can be an equilibrium!

Optimal policy without state-contingent taxes

compare

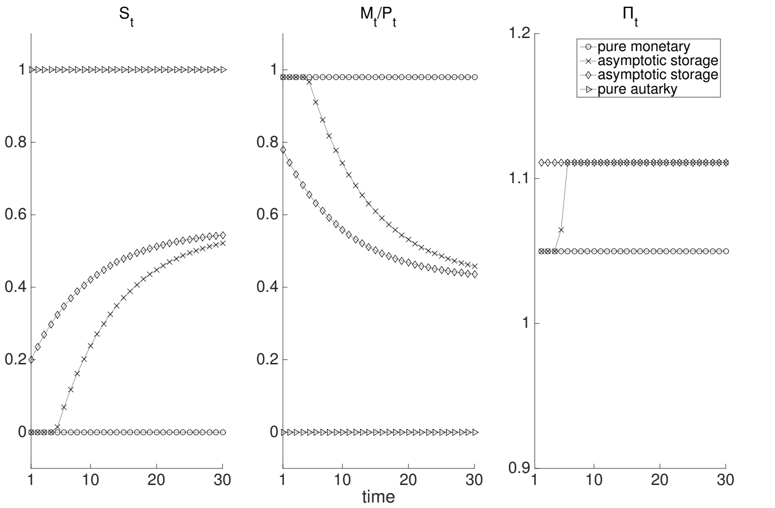

Figure: Uniqueness with fixed taxes for $\theta = 0.9$, $W = 2$, $\bar{M} = 1$ and $\lambda = 0.05$.

Multiplicity without state-contingent taxes

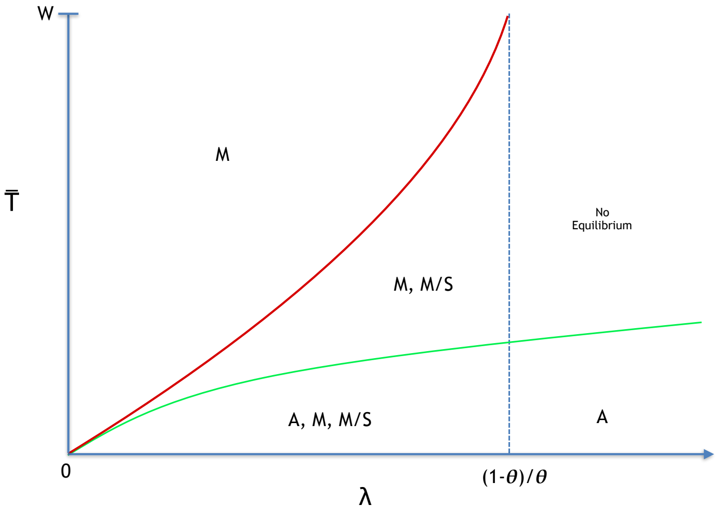

Figure: Multiplicity: A=autarky, M/S=asymptotic storage, M=pure monetary

4. Conclusion

Conclusion

- Monetary stability relies on the **off-equilibrium active role** of a monetary-fiscal authority.

Conclusion

- Monetary stability relies on the **off-equilibrium active role** of a monetary-fiscal authority.
  - *The real value of fiat money is in the implicit fiscal guarantee.*

Conclusion

- Monetary stability relies on the **off-equilibrium active role** of a monetary-fiscal authority.
  - *The real value of fiat money is in the implicit fiscal guarantee.*
- Big macroprudential implications:

Conclusion

- Monetary stability relies on the **off-equilibrium active role** of a monetary-fiscal authority.
  - *The real value of fiat money is in the implicit fiscal guarantee.*
- Big macroprudential implications:
  - Could a truly private monetary system exist? E.g.Cryptocurrencies?

Conclusion

- Monetary stability relies on the **off-equilibrium active role** of a monetary-fiscal authority.
  - *The real value of fiat money is in the implicit fiscal guarantee.*
- Big macroprudential implications:
  - Could a truly private monetary system exist? E.g.Cryptocurrencies?
  - Cryptocurrencies, without fiscal support, cannot survive to a crisis...

Conclusion

- Monetary stability relies on the **off-equilibrium active role** of a monetary-fiscal authority.
  - *The real value of fiat money is in the implicit fiscal guarantee.*
- Big macroprudential implications:
  - Could a truly private monetary system exist? E.g.Cryptocurrencies?
  - Cryptocurrencies, without fiscal support, cannot survive to a crisis...
  - ...unless it becomes "too big to fail"

Conclusion

- Monetary stability relies on the **off-equilibrium active role** of a monetary-fiscal authority.
  - *The real value of fiat money is in the implicit fiscal guarantee.*
- Big macroprudential implications:
  - Could a truly private monetary system exist? E.g.Cryptocurrencies?
  - Cryptocurrencies, without fiscal support, cannot survive to a crisis...
  - ...unless it becomes “too big to fail”
  - ...in a crisis an authority could hardly resist fiscal intervention

Conclusion

- Monetary stability relies on the **off-equilibrium active role** of a monetary-fiscal authority.
  - *The real value of fiat money is in the implicit fiscal guarantee.*
- Big macroprudential implications:
  - Could a truly private monetary system exist? E.g.Cryptocurrencies?
  - Cryptocurrencies, without fiscal support, cannot survive to a crisis...
  - ...unless it becomes "too big to fail"
  - ...in a crisis an authority could hardly resist fiscal intervention

    - QE on toxic assets, why not on cryptocurrencies in the future?

Conclusion

- Monetary stability relies on the **off-equilibrium active role** of a monetary-fiscal authority.
  - *The real value of fiat money is in the implicit fiscal guarantee.*
- Big macroprudential implications:
  - Could a truly private monetary system exist? E.g.Cryptocurrencies?
  - Cryptocurrencies, without fiscal support, cannot survive to a crisis...
  - ...unless it becomes "too big to fail"
  - ...in a crisis an authority could hardly resist fiscal intervention

    - QE on toxic assets, why not on cryptocurrencies in the future?

Conclusion

- Monetary stability relies on the **off-equilibrium active role** of a monetary-fiscal authority.
  - *The real value of fiat money is in the implicit fiscal guarantee.*
- Big macroprudential implications:
  - Could a truly private monetary system exist? E.g.Cryptocurrencies?
  - Cryptocurrencies, without fiscal support, cannot survive to a crisis...
  - ...unless it becomes "too big to fail"
  - ...in a crisis an authority could hardly resist fiscal intervention

    - QE on toxic assets, why not on cryptocurrencies in the future?

Money is what is guaranteed by the gov'nt...

Conclusion

- Monetary stability relies on the **off-equilibrium active role** of a monetary-fiscal authority.
  - *The real value of fiat money is in the implicit fiscal guarantee.*
- Big macroprudential implications:
  - Could a truly private monetary system exist? E.g.Cryptocurrencies?
  - Cryptocurrencies, without fiscal support, cannot survive to a crisis...
  - ...unless it becomes "too big to fail"
  - ...in a crisis an authority could hardly resist fiscal intervention

    - QE on toxic assets, why not on cryptocurrencies in the future?

Money is what is guaranteed by the gov'nt...

...but also, the gov'nt will guarantee what is used as Money.

No policy leads to indeterminacy

back

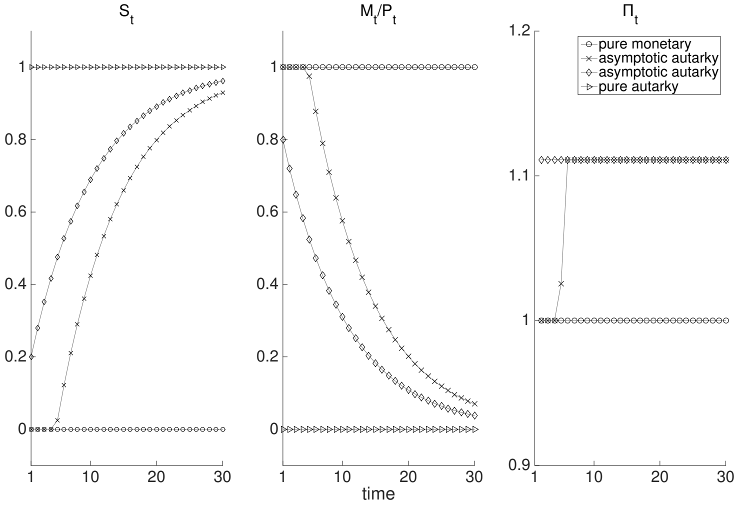

Figure: Equilibria without policy intervention for $\theta = 0.9$, $W = 2$ and $\bar{M} = 1$.

No policy leads to indeterminacy back

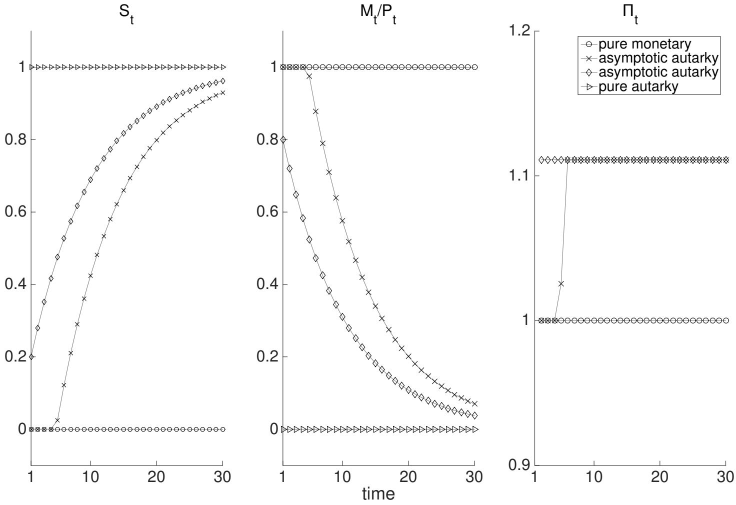

Figure: Equilibria without policy intervention for $\theta = 0.9$, $W = 2$ and $\bar{M} = 1$.