Leaky Capital Controls in the Presence of Savvy Financial Markets

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Capital Controls & Regulatory Evasion

Research Question:

How effective are imperfectly enforceable capital controls?

This Paper:

- Stylized models of inefficient capital inflows and regulatory evasion
- Domestic regulator uses capital controls to correct externalities
- Financial sector strategically evades capital controls

Results:

- Leaky capital controls can still improve welfare
- Controls are more binding when evasion is costly...
- ...but, "first-best" equilibrium is no longer possible
- A "naive planner" could inadvertently reduce welfare

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Background

- Capital controls are hip again
- IMF: should be part of the "policy toolkit" (*under some conditions*)
- New theoretic literature on welfare rationale:
  - Insulate against volatile capital flows
  - Avoid excessive exchange rate appreciation
  - "externalities view" $\rightarrow$ overborrowing in equilibrium
  - e.g. Lorenzoni 2008; Jeanne and Korinek, 2010; Davis and Presno, 2014
- Less formal attention on issue of enforcement and strategic evasion
  - Two exceptions:
  - Bengui and Bianchi, 2014 – prudential k-controls with shadow banking
  - Schulze, 2000 – PE of capital controls

Evasion by "sophisticated" financial markets

- It is often asserted that capital controls may not be effective because they are easily evaded...
  - Edwards (1999): evasion through misinvoicing lowered the efficacy of Chile's controls
  - Garber (1998): derivatives may make it easier to evade controls
  - Klein (2012): Harder to enforce controls in countries with "experienced" or sophisticated financial markets
- ...But if evasion is costly controls will still be binding
  - "wedge" between domestic and international financial markets
  - Levy-Yeyati et al (2008): controls increase "cross-market premium"
- What determines this cost?
  - enforcement capacity of the regulator?
  - financial sophistication?
  - strategic considerations?

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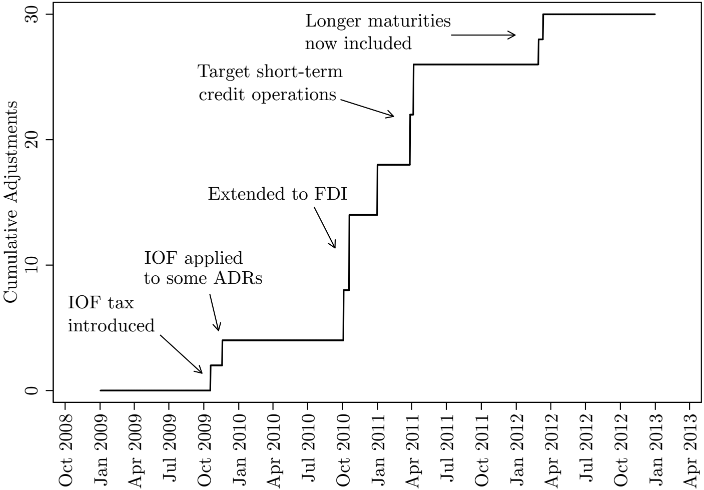
Timeline of Brazil's IOF tax

Cumulative Number of Policy Changes



Benchmark Framework

Basic Elements:

- Small Open Economy
- 2 periods: t=1, t=2
- Endowment economy
- Banks intermediate between world and domestic market
  - Competitive benchmark:

$$R = R^* + \tau$$

- "Dutch disease" externality to motivate k-controls
  - Period 2 endowment is decreasing in aggregate capital inflows

$$Y = \bar{Y} - \varphi D$$

  - where $\varphi > 0$ is the size of the externality

Benchmark Framework

Households:

$$\max_{c_1, c_2} \; u(c_1) + \beta u(c_2) \qquad \text{subject to}$$

$$c_1 = d \;\; , \;\; c_2 = y - Rd + T$$

- y : Individual endowment
- R: Domestic gross interest rate
- T: Lump-sum transfers

Note: HH take $Y = \bar{Y} - \varphi D$ as given!

Benchmark Framework

Laissez-faire equilibrium $(\tau = 0)$

$$u'(D_{lf}) = \beta R^* u' \left[\bar{Y} - (R^* + \varphi) D_{lf} \right]$$

- Features *overborrowing*!
- Intuition: private rate of return $\neq$ social rate of return

Social Planner equilibrium

$$u'(D_{sp}) = \beta (R^* + \varphi) u' \left[\bar{Y} - (R^* + \varphi) D_{sp} \right]$$

Optimal Capital Controls

$$\tau = \varphi$$

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Basic Evasion Model

- Game between "banks" and the "regulator"
  - Banks borrow internationally and lend to households
  - Regulator imposes capital controls to achieve SP solution
  - Banks attempt to evade controls to minimize borrowing costs
- Limited Institutional capacity
  - Developing country
  - Ability to enforce regulation is constrained
  - Imperfect monitoring of bank borrowing
  - *Implication:* effective tax is endogenous
- Role of financial "sophistication" or "complexity
  - More "sophisticated" fin. markets are harder to regulate
  - Can think of as *regulatory loopholes*
  - Other interpretation: fin. complexity implies more instruments through which to evade

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Loophole Game

Definition (Loophole Game)

- **Players:** *the "bank" (B) and the "regulator" (R).*
- **Actions:** *instrument borrowing and monitoring choices*

$$A_i = \{1, 2, \ldots, J\} \text{ for } i = \{B, R\}$$

- **Payoffs:**

$$\textit{Player B:} \qquad v(a_B, a_R) = \begin{cases} -\tau & \forall\ a_B = a_R \\ 0 & \forall\ a_B \neq a_R \end{cases}$$

$$\textit{Player R:} \qquad m(a_B, a_R) = \begin{cases} \tau & \forall\ a_B = a_R \\ 0 & \forall\ a_B \neq a_R \end{cases}$$

Regulatory Equilibria

Effective Inflow Tax:

$$\tilde{\tau} = \frac{\tau}{J}$$

- Fraction of tax "leaks" due to evasion

Definition (Naive Planner)

The Naive Planner does not take bank evasion into account and sets the inflow tax at $\tau_{np} = \varphi$

Definition (Sophisticated Planner)

The Sophisticated Planner is the first-mover and anticipates bank evasion. The SP maximizes social welfare subject to the bank's best response function and sets $\tau_{sp} = J\varphi$

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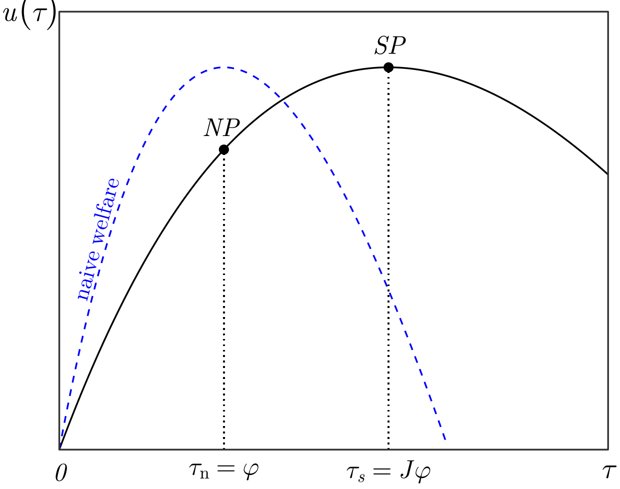
Social welfare in the loophole game



A Model with Perfect Evasion

- Enforcement game is played sequentially rather than simultaneously
- Banks incur evasion costs $\gamma > 0$ per unit of funds intermediated
- Timing:
  1. Regulator chooses which loophole to monitor
  2. Bank chooses to evade or to comply with k-controls
  3. If evade, bank observes regulator's move and chooses loophole

Implication:

- Sufficiently large τ can "trigger" evasion
- Capital control loses traction beyond threshold

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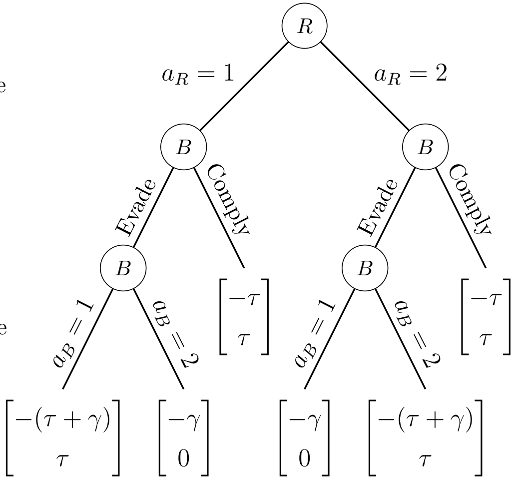
Sequential loophole game with two loopholes ($J = 2$)

Stage 1: R chooses loophole

Stage 2: B evasion decision

Stage 3: B chooses loophole



Equilibrium

Domestic Interest Rate:

$$R = R^* + \min\{\tau, \gamma\}$$

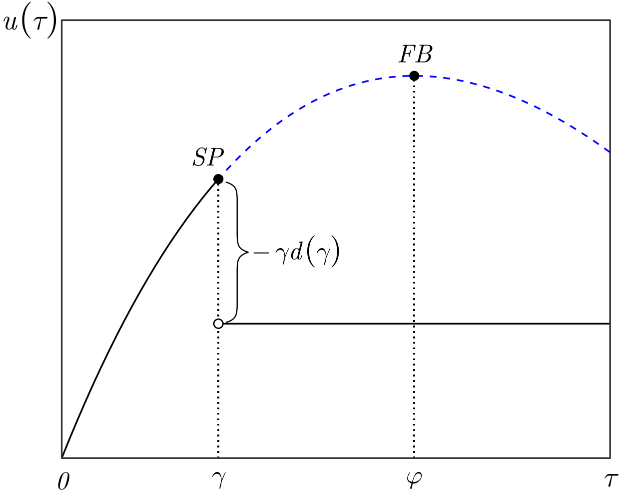
Period 2 constraint:

$$C_2 = \begin{cases} \bar{Y} - (\varphi + R^*)\, D & \text{if Bank complies } (\tau < \gamma) \\ \bar{Y} - (\varphi + R^* + \gamma)\, D & \text{if Bank evades } (\tau \geq \gamma) \end{cases}$$

Sophisticated Planner's problem:

$$\max_{\tau} \; u(D) + \beta u(C_2) \quad \text{subject to} \quad D = \max\{D(\tau), D(\gamma)\}$$

Social welfare in the sequential loophole game



Costly Evasion Setup

Banks' Problem

$$\max_{d,z} \ \mathbb{E}\{\pi\} = (R - R^* - p(\kappa)\tau)d - \gamma z$$

where

$$\kappa \equiv \frac{z}{d} \quad , \quad p'(\cdot) < 0 \ , \quad p''(\cdot) > 0$$

First-Order Conditions

$$R = R^* + \tau(p(\kappa) - p'(\kappa)\kappa)$$

$$-p'(\kappa)\tau = \gamma$$

which implies...

$$\kappa^* = \kappa(\tau) \quad , \quad \kappa'(\tau) > 0$$

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Equilibrium

Decentralized Equilibrium is the fixed point D_{de} of:

$$u'(D_{de}) = \beta R u' \left[\bar{Y} - (\varphi + R^* + \gamma\kappa(\tau))D_{de}\right]$$

where

$$R = R^* + \tau(p(\cdot) - p'(\cdot)\kappa)$$

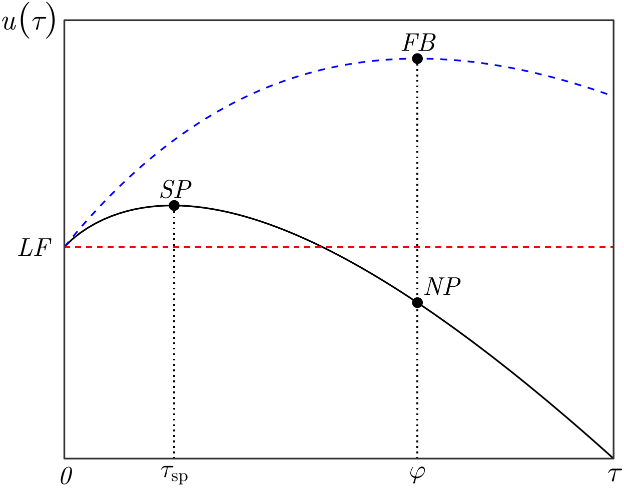
Sophisticated Planner's problem

$$\max_{\tau} \quad u(D) + \beta u \left[\bar{Y} - (\varphi + R^* + \gamma\kappa(\tau))D\right]$$

subject to

$$D = D_{de}(\tau) \qquad \text{and} \qquad z^* = \kappa(\tau)D_{de}$$

Social welfare in the costly evasion game



Costly Evasion

Intuition?

- Capital controls can lead to deadweight loss from evasion (γz^*)
- i.e. Misallocation of goods from consumption to evasion activities
- Pure waste from society's perspective!

Implication:

- Social optimum is not a decentralized equilibrium
- *BUT* capital controls can still do better than laissez-faire

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A Model with Financial Innovation

In Progress!

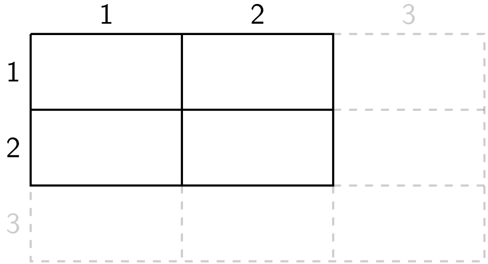
A Model with Financial Innovation

Building blocks

- Overlapping generations that live for two periods
- Imperfect financial sector competition
  - Financial services are a CES composite
  - Each service type is provided by a single monopolist
- Monopolist "innovates" $\rightarrow$ endogenous J
  - Rents incentivize discovery of new avenues for evasion
  - Standard Schumpeterian model
  - Monopolist keeps competitive advantage for one period
- Market is contestable
  - competitive fringe pins down interest rate

A Digression on "Innovation"...

Innovation as increase in the game strategy space



$$R = R^* + \frac{\tau}{2}$$

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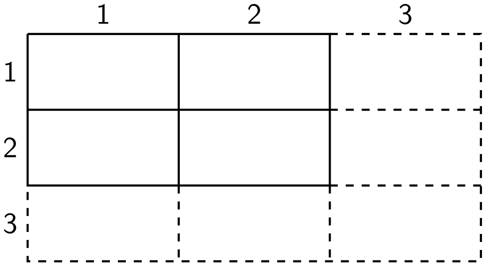

$$R = R^* + \frac{\tau}{3}$$

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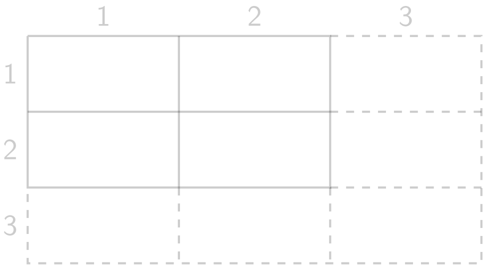

General solution with J instruments $\longrightarrow R = R^* + \frac{\tau}{J}$

Monopolist Bank's Problem (sketch)

Flow profits

$$\pi_{it} = \left(R - R^* - \frac{\tau}{J_t} \right) D_{it}$$

where

$$J_t = J_{t-1} + 1$$

Limit Price Interest Rate

$$R = R^* + \frac{\tau}{J_{t-1}}$$

Implies...

$$\pi_{it} = \frac{\tau D_{it}}{J_{t-1}(J_{t-1} + 1)}$$

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Innovation Decision

$$\max_z \mathbb{E}\{\Pi_{it}\} = \Psi(z)\pi_{it} - z$$

where

$$\Psi(z) \in [0,1] \text{ and } \Psi'(z) > 0\ ,\quad \Psi''(z) < 0$$

Solution

$$z^* = z(\tau)$$

where

$$\frac{\partial z}{\partial \tau} = -\frac{\Psi'(z^*)\pi'(\tau)}{\Psi''(z^*)\pi(\tau)} > 0$$

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Innovation

Expected Evolution of Loopholes

$$\mathbb{E}\{J_t\} = \Psi(z^*)\pi(\tau) + J_{t-1}$$

- Loopholes J_t will increase as long as $\tau > 0$
- In the limit $t \to \infty$, $J_t \to \infty$
- Capital controls become completely ineffective over time

$$\lim_{t \to \infty} \frac{\tau}{J_t} = 0$$

- Implies policymakers need to continuously close loopholes!

Thank You :)