On the International Dimension of Fiscal Policy

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Motivation

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  - Is the prescription different than the case of closed economies?

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- What is the optimal level of tax smoothing?
  - Does the answer depend on the optimal level of exchange rate volatility?
- From a positive perspective, transmission mechanism of fiscal shocks might depend on exchange rate fluctuations.

Motivation (2):

Complementing the literature

- Neoclassical literature on optimal fiscal policy has focused mainly on closed economy models

  - when taxes are distortionary, taxes should be smoothed over time and across states of nature

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- Bridging the gap...

Approach

- Theoretical, normative analysis of fiscal policy
- Formalize a small open economy with endogenous fiscal policy
- Characterize a utility based loss function each specification
- Derive the optimal fiscal policy (also look at the planner's problem)
- Analyse the implication for tax and exchange rate volatility

Anticipating the results

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- Our analysis shows that in a small open economy optimal policy departs from tax smoothing.
- As emphasised in the optimal monetary policy literature policymakers in open economies are influenced by a "terms of trade externality".

  - E.g. In an open economy that is a monopolist producer of its own goods, a real exchange rate appreciation can lead to higher welfare by allowing domestic agents to consume more for lower levels of domestic production.

  - Thus, policymakers have an incentive to use fiscal policy to exploit this externality.

  - As a result, distortionary taxes vary over time and across states of nature.
- When we consider the joint fiscal and monetary policy problem, there is a trade-off between price stability and tax-smoothing that arises from the terms of trade externality. Quantitatively cost of inflation are high and optimal inflation volatility is low.

The Model:

overview

- 2-country DSGE model $\Rightarrow$ small open economy
- Home bias $\Rightarrow$ deviations from PPP
- Monopolistic competition and nominal rigidities *a la* Calvo $\Rightarrow$ Role for monetary policy
- Preferences $\Rightarrow$ allow for trade imbalances
- Fiscal authority issues nominal debt and set income taxes (extension includes the case of indexed linked debt)
- Stochastic environment: domestic and foreign productivity shocks, markup and fiscal shocks

The model:
Preferences

Utility (country H – measure n)

$$U_t = E_t \sum_{s=t}^{\infty} \beta^{s-t} \left[U(C_s) - V\left(y(h)_s, \varepsilon_{Y,s} \right) \right]$$

$$U_t = E_t \sum_{s=t}^{\infty} \beta^{s-t} \left[\log C_s - \frac{1}{n} \int_0^n \frac{\varepsilon_{Y,s}^{-\eta} y\left(h\right)_s^{1+\eta}}{1+\eta} \right]$$

Home bias (Sutherland 2001)

$$C = \left[v^{\frac{1}{\theta}} C_H^{\frac{\theta-1}{\theta}} + (1-v)^{\frac{1}{\theta}} C_F^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}$$

$(1-v) = (1-n)\lambda$ and $v^* = n\lambda$

$$C_H = \left[\left(\frac{1}{n} \right)^{\frac{1}{\sigma}} \int_0^n c\left(z\right)^{\frac{\sigma-1}{\sigma}} dz \right]^{\frac{\sigma}{\sigma-1}}$$

The model:

Relative prices and demand

Law of one price: $p(z) = S \cdot p^*(z)$.
Home bias $\Rightarrow$ PPP does not hold: $Q_t \equiv S_t P_t^* / P_t$
SOE demand

$$y_t(h) = \left(\frac{p_t(h)}{P_{H,t}}\right)^{-\sigma} \left(\frac{P_{H,t}}{P_t}\right)^{-\theta} \left((1-\lambda) C_t + \lambda \left(\frac{1}{Q_t}\right) C_t^*\right)$$

RoW demand

$$y_t(f) = \left(\frac{p_t^*(f)}{P_t^*}\right)^{-\sigma} C_t^*$$

The model:
Asset markets

Complete markets

$$\frac{U_C\left(C^*_{t+1}\right)}{U_C\left(C^*_t\right)} = \frac{U_C\left(C_{t+1}\right)}{U_C\left(C_t\right)}\frac{Q_{t+1}}{Q_t}$$

Government issues one period nominal risk free bonds expressed in local currency units, collects taxes and faces exogenous expenditure streams. Government debt D_t^n, expressed in nominal terms, follows the law of motion:

$$D_t^n = D_{t-1}^n (1 + i_{t-1}) - P_{H,t} s_t$$

where s_t is the real primary budget surplus:

$$s_t \equiv \tau_t Y_t - G_t - Tr_t$$

The case real bonds:

$$D_t^r = D_{t-1}^r (1 + i_{t-1}^r) + \frac{P_{H,t}}{P_t} s_t \qquad (1)$$

The model:

Monopolistic competitive firms

Firms' behavior (flexible prices)
Set prices as a markup over marginal costs

$$p_{H,t} = \frac{\sigma mu_t}{(1-\tau_t)(\sigma-1)} \frac{V_y\left(Y_t, \varepsilon_{Y,t}\right)}{U_c(C_T)}$$

Social planner vs. competitive allocation

Understanding the policy incentive:

- Planner problem (maximizes agents' utility subject to resourse constraint and complete markets assumption):

$$p_{H,t}U_c(C_t) = Q(RS_t)V_y(Y_t, \varepsilon_{Y,t})$$

  Competitive equilibrium:

$$p_{H,t}U_c(C_t) = \frac{\sigma mu_t}{(1-\tau_t)(\sigma-1)}V_y(Y_t, \varepsilon_{Y,t})$$

- Efficiency condition

$$\frac{\sigma mu_t}{(1-\tau_t)(\sigma-1)}Q(RS_t) = 1$$

- $\Rightarrow$ Movements in the *tax rate*, in *the real exchange rate*, and *markup shocks* generate inefficiencies (i.e. competitive equilibrium departs from planner's problem)

Social planner vs. competitive allocation (2)

- Efficiency condition

$$\frac{\sigma mu_t}{(1-\tau_t)(\sigma-1)} Q(RS_t) = 1$$

- Closed economy

$$\frac{\sigma mu_t}{(1-\tau_t)(\sigma-1)} = 1$$

Tax smoothing is optimal when there are no markup shocks

- Steady state tax subsidy eliminates steady-state distortion

$$\bar{\tau} = -\frac{1}{\sigma - 1}$$

(assuming $\overline{mu} = 1$)

- Open economy tax smoothing no longer optimal
- Steady state optimal tax depends on degree of openness and substitutability between goods

$$\bar{Q}(\lambda, \rho, \theta)$$

Understanding the ToT externality

- $\theta\rho > 1$: real exchange rate appreciation (or ToT improvement) increases welfare/ reduces loss
- Substitute goods: appreciation decreases C_H but increases C_F - reduction in $U(C)$ smaller than in $V(Y)$
- Complement goods: appreciation cannot divert consumption towards foreign goods (decrease in C_H accompanied by decrease in C_F)
- $\theta\rho < 1$: depreciation improve welfare $\Rightarrow$ leads to higher C_H that increases marginal utility of C_F: $U(C) \uparrow > V(Y) \uparrow$
- Externality only eliminated only when the economy is closed ($\lambda = 0$) or when $\theta\rho = 1$ - in this case marginal utility of C_H independent of C_F, and vice-versa

Linear Quadratic Approach:
Motivation

- Efficiency condition can pin down the optimal level of taxes in the case of nominal bonds

  $\Rightarrow$ Set taxes to eliminate difference between social planner and competitive equilibrium

  $\Rightarrow$ Government solvency condition satisfied given inflation can replicate state contingent debt
- But in the case of real bonds this is not the case
- Have to solve system of non-linear equations
- Linear quadratic loss function can also help policy implementation

Linear Quadratic Approach:
Loss function

- Agent´s Utility $\Rightarrow$ Welfare metric
- Method of Benigno&Woodford (2003), Sutherland (2002)

$$\min \; U_c \bar{C} E_{t_0} \sum \beta^t \left[\frac{1}{2} \Phi_\tau (\hat{\tau}_t - \hat{\tau}_t^T)^2 + \frac{1}{2} \Phi_{RS} \hat{rs}_t^2 \right] + t.i.p + O(||\xi||^3),$$

- Closed economy

$$\min \; U_c \bar{C} E_{t_0} \sum \beta^t \left[\frac{1}{2} \Phi_\tau (\hat{\tau}_t - \hat{\tau}_t^T)^2 \right] + t.i.p + O(||\xi||^3),$$

- Open economy: $\Phi_{RS} \hat{rs}_t^2$ arises given the terms of trade externality
- Corsetti and Pesenti (2001): improvements in ToT $\Rightarrow$ allow larger consumption for a given level of labour effort (or domestic production)

Optimal Policy:
The case of nominal debt

- Optimal targeting rule

$$\Phi_{RS}\widehat{rs}_t + \frac{(1+l)}{\rho(1-\lambda)}\Phi_\tau(\widehat{\tau}_t - \widehat{\tau}_t^{T'}) = 0.$$

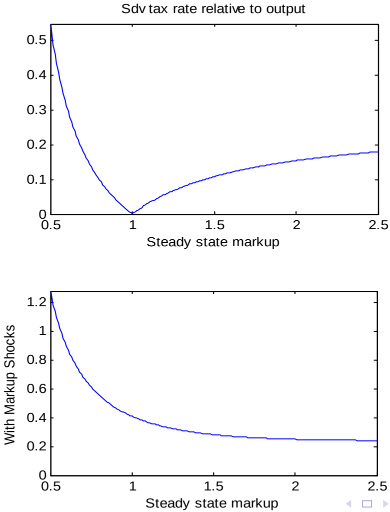
- Closed economy:

$$\widehat{\tau}_t - \widehat{\tau}_t^{T'} = 0.$$

Taxes are constant when $\widehat{\tau}_t^{T'} = 0 \Rightarrow$ when there are no markup shocks and the steady state is efficient

Optimal Policy:

Closed economy with nominal debt



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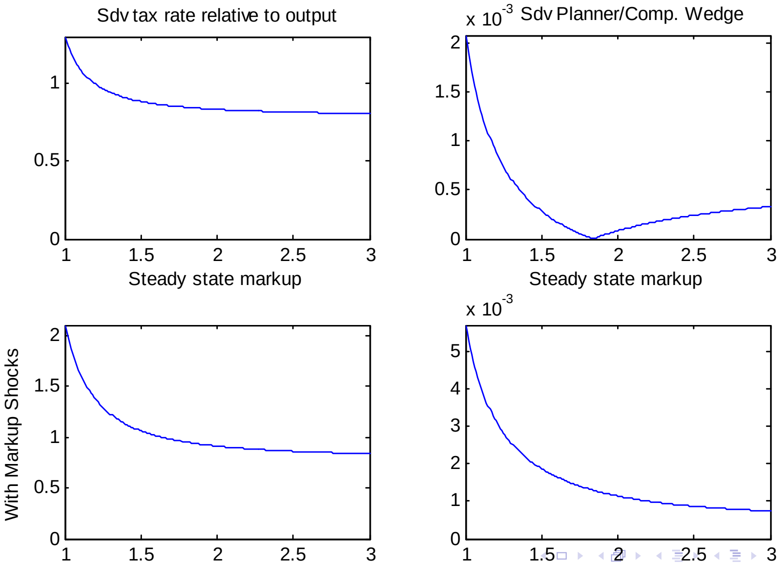
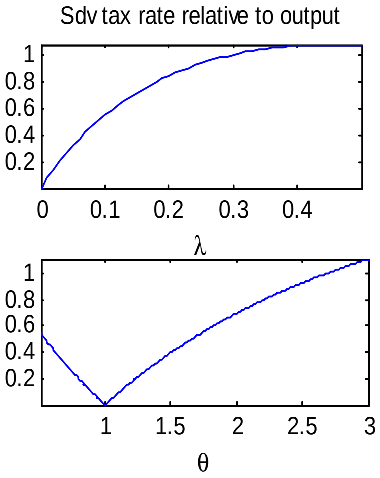


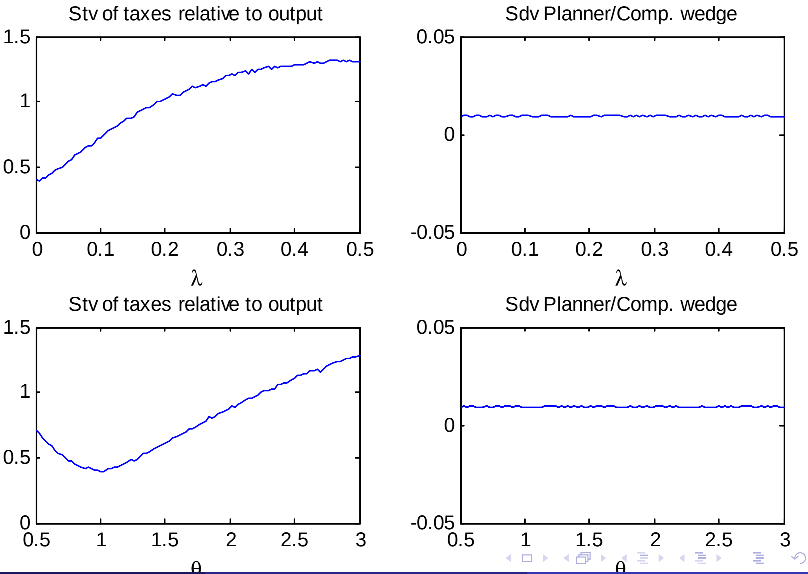
Optimal Policy:

Open economy with nominal debt (efficient steady state and no markup shocks)



Optimal Policy:

Open economy with real debt (efficient steady state and no markup shocks)



Optimal Policy: Sticky prices targeting rules

Firms set prices following partial adjustment rule a la Calvo
Loss function now depends also on domestic producer inflation
General forms of targeting rules

$$\left[\frac{(1+l)\Phi_y}{(1-\lambda)\rho}\right]\Delta\widehat{y}_t+\Phi_{RS}\Delta\widehat{rs}_t+\left[\frac{k\Phi_\pi}{(1-\overline{\tau})+bd_{ss}k}\right](\gamma\widehat{\pi}_t^H+d_{ss}(a+1)\widehat{\pi}_{t-1}^H)=0$$

$$E_t\widehat{\pi}_{t+1}^H=0,$$

Optimal Policy: Sticky prices targeting rules

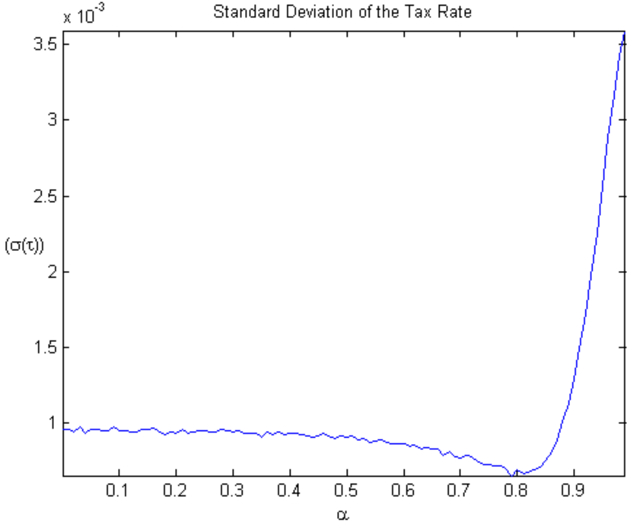


Figure: Figure 5

Concluding remarks

- Simple framework for fiscal policy in open economy
- Normative analysis: Fiscal policy problem in an open economy $\neq$ closed economy
  - Optimal tax variability in an open economy $\neq$ closed economy
  - Optimal steady state tax in an open economy $\neq$ closed economy
- Reason: incentive to use taxes to affect the terms of trade
- Fiscal policy efficiency depends on the type of debt.