Optimal Policy under Dollar Pricing

Konstantin Egorov
kegorov@NES.ru

Dmitry Mukhin
dmukhin@WISC.edu

Inflation: Dynamics, Expectations, and Targeting
July 13, 2021

Motivation

- “Dominant currency paradigm”
  - world prices set in dollars (Goldberg-Tille’08) ▸ show
  - world prices sticky in dollars (Gopinath’15)
  - asymmetric transmission of shocks (Gopinath et al’20)

Motivation

- “Dominant currency paradigm”
  - world prices set in dollars (Goldberg-Tille’08) ▸ show
  - world prices sticky in dollars (Gopinath’15)
  - asymmetric transmission of shocks (Gopinath et al’20)

- What are implications of DCP for
  1. float vs. peg? (Friedman’53)
  2. capital controls? (Blanchard’17)
  3. Fed’s policy and exorbitant privilege? (Bernanke’17, Gourinchas-Rey’07)
  4. gains from cooperation? from currency areas? (Mundell’61)

Motivation

- "Dominant currency paradigm"
  - — world prices set in dollars (Goldberg-Tille'08) ▸ show
  - — world prices sticky in dollars (Gopinath'15)
  - — asymmetric transmission of shocks (Gopinath et al'20)

- What are implications of DCP for
  1. float vs. peg? (Friedman'53)
  2. capital controls? (Blanchard'17)
  3. Fed's policy and exorbitant privilege? (Bernanke'17, Gourinchas-Rey'07)
  4. gains from cooperation? from currency areas? (Mundell'61)

- Relevant from both normative and positive perspectives ▸ show
  - — can DCP rationalize policies followed by open economies?

This Paper

- New Keynesian open economy model

This Paper

- New Keynesian open economy model
- Key ingredients:
  - exporters use DCP
  - local firms use PCP

This Paper

- New Keynesian open economy model
- Key ingredients:
  - — exporters use DCP ⇒ high ERPT into *border* prices ▸ show
  - — local firms use PCP
  - — foreign intermediates

  $\Big\}$ ⇒ low ERPT into *retail* prices

This Paper

- New Keynesian open economy model
- Key ingredients:
  - exporters use DCP ⇒ high ERPT into *border* prices ▸ show
  - local firms use PCP
  - foreign intermediates

    } ⇒ low ERPT into *retail* prices
- Otherwise general setup:
  - arbitrary assets, preferences, technology, nominal rigidities, shocks
  - fully non-linear stochastic solution

This Paper

- New Keynesian open economy model
- Key ingredients:
  - exporters use DCP ⇒ high ERPT into *border* prices ▸ show
  - local firms use PCP
  - foreign intermediates

    } ⇒ low ERPT into *retail* prices
- Otherwise general setup:
  - arbitrary assets, preferences, technology, nominal rigidities, shocks
  - fully non-linear stochastic solution
- Main findings:
  1. optimality of inflation targeting for non-U.S. economies

This Paper

- New Keynesian open economy model
- Key ingredients:
  - exporters use DCP ⇒ high ERPT into *border* prices ‣ show
  - local firms use PCP
  - foreign intermediates

  $\Big\}$ ⇒ low ERPT into *retail* prices
- Otherwise general setup:
  - arbitrary assets, preferences, technology, nominal rigidities, shocks
  - fully non-linear stochastic solution
- Main findings:
  1. optimality of inflation targeting for non-U.S. economies
  2. global monetary cycle

This Paper

- New Keynesian open economy model
- Key ingredients:
  - — exporters use DCP ⇒ high ERPT into *border* prices ▸ show
  - — local firms use PCP
  - — foreign intermediates

  $\}$ ⇒ low ERPT into *retail* prices
- Otherwise general setup:
  - — arbitrary assets, preferences, technology, nominal rigidities, shocks
  - — fully non-linear stochastic solution
- Main findings:
  1. optimality of inflation targeting for non-U.S. economies
  2. global monetary cycle
  3. no case for capital controls
  4. conflict of interests between the U.S. and RoW

Relation to the Literature

- Empirical evidence:
  - prices are sticky in dollars: Goldberg & Tille (2008), Gopinath & Rigobon (2008), Gopinath, Itskhoki & Rigobon (2010), Gopinath (2016)
  - international spillovers under DCP: Cravino (2014), Zhang (2018), Ilzetzki, Reinhart & Rogoff (2019), Gopinath et al (2019)
- Theories of currency choice:
  - Krugman (1980), Corsetti & Pesenti (2002), Bacchetta & van Wincoop (2005), Engel (2006), Goldberg & Tille (2008), Chahrour & Valchev (2017), Gopinath & Stein (2017), Drenik, Kirpalani & Perez (2018), Mukhin (2018)
- Optimal policy in open economy:
  - PCP/LCP: Clarida, Gali & Gertler (2001, 2002), Devereux & Engel (2003), Benigno & Benigno (2003), Gali & Monacelli (2005), De Paoli (2009), Engel (2011), Corsetti, Dedola & Leduc (2010, 2018)
  - DCP: Corsetti & Pesenti (2007), Devereux, Shi & Xu (2007), Goldberg & Tille (2009), Casas, Diez, Gopinath & Gourinchas (2017)
    - ⇒ much more general setup, different intuition, new results. . . ▸ cf
  - capital controls: Jeanne & Korinek (2010), Bianchi (2011), Farhi & Werning (2012, 2013, 2016, 2017), Costinot, Lorenzoni & Werning (2014)

SETUP

Setup

- Infinite-horizon model w/ continuum of SOEs (Gali-Monacelli'2005)
  - U.S. is symmetric except for DCP

Setup

- Infinite-horizon model w/ continuum of SOEs (Gali-Monacelli'2005)
  - U.S. is symmetric except for DCP
- Households: ▸ show
  - demand for products, labor supply and risk-sharing
  - nested CES w/ macro elasticity θ, micro elasticity ε, home bias $1-\gamma$
- Firms: ▸ show
  - CRS production from labor and intermediates
  - Rotemberg price setting: PCP in local market + DCP in exports

Setup

- Infinite-horizon model w/ continuum of SOEs (Gali-Monacelli'2005)
  - U.S. is symmetric except for DCP
- Households: ▸ show
  - demand for products, labor supply and risk-sharing
  - nested CES w/ macro elasticity θ, micro elasticity ε, home bias $1-\gamma$
- Firms: ▸ show
  - CRS production from labor and intermediates
  - Rotemberg price setting: PCP in local market + DCP in exports
- To isolate new policy motives assume:

A1: production subsidies $\tau_i = \frac{\varepsilon-1}{\varepsilon}$, $\tau_i^* = 1$ and no markup shocks
$\Rightarrow$ *eliminate monopolistic distortion and the terms-of-trade externality*

A2: payoffs of assets D_t^h are independent from monetary policies
$\Rightarrow$ *monetary policy does not aim to complete asset markets*

Setup

- Infinite-horizon model w/ continuum of SOEs (Gali-Monacelli'2005)
  - U.S. is symmetric except for DCP
- Households: ▸ show
  - demand for products, labor supply and risk-sharing
  - nested CES w/ macro elasticity θ, micro elasticity ε, home bias $1-\gamma$
- Firms: ▸ show
  - CRS production from labor and intermediates
  - Rotemberg price setting: PCP in local market + DCP in exports
- To isolate new policy motives assume:

  A1: production subsidies $\tau_i = \frac{\varepsilon - 1}{\varepsilon}$, $\tau_i^* = 1$ and no markup shocks

  $\Rightarrow$ *eliminate monopolistic distortion and the terms-of-trade externality*

  A2: payoffs of assets D_t^h are independent from monetary policies

  $\Rightarrow$ *monetary policy does not aim to complete asset markets*
- **Lemma**: the flexible-price equilibrium ▸ show
  - (a) is efficient from the perspective of individual economy,
  - (b) can be implemented under PCP by targeting $\pi_{iit} = 0$.

NON-U.S. MONETARY POLICY

Optimal Policy

Proposition (Non-U.S. policy)

The optimal monetary policy in a non-U.S. economy stabilizes prices of domestic producers $\pi_{iit} = 0$*. The resulting allocation is not efficient.*

Optimal Policy

Proposition (Non-U.S. policy)

The optimal monetary policy in a non-U.S. economy stabilizes prices of domestic producers $\pi_{iit} = 0$. *The resulting allocation is not efficient.*

1. Optimal policy can be summarized with a simple "sufficient statistic"
    - invariant to parameters/details of the model

Optimal Policy

Proposition (Non-U.S. policy)

The optimal monetary policy in a non-U.S. economy stabilizes prices of domestic producers $\pi_{iit} = 0$. *The resulting allocation is not efficient.*

1. Optimal policy can be summarized with a simple "sufficient statistic"
   - invariant to parameters/details of the model
2. PPI vs. CPI: target prices that are sticky in *local currency* ▸ show
   - may include retail prices of imported goods

Optimal Policy

Proposition (Non-U.S. policy)

The optimal monetary policy in a non-U.S. economy stabilizes prices of domestic producers $\pi_{iit} = 0$. *The resulting allocation is not efficient.*

1. Optimal policy can be summarized with a simple "sufficient statistic"
   - invariant to parameters/details of the model
2. PPI vs. CPI: target prices that are sticky in *local currency* ▸ show
   - may include retail prices of imported goods
3. Optimal policy is time consistent

Optimal Policy

Proposition (Non-U.S. policy)

The optimal monetary policy in a non-U.S. economy stabilizes prices of domestic producers $\pi_{iit} = 0$. The resulting allocation is not efficient.

1. Optimal policy can be summarized with a simple "sufficient statistic"
   - — invariant to parameters/details of the model
2. PPI vs. CPI: target prices that are sticky in *local currency* ▸ show
   - — may include retail prices of imported goods
3. Optimal policy is time consistent
4. Same optimal policy as under PCP despite inefficient outcome: ▸ show
   - — PCP: given export prices, MP achieves optimal exports $Y_{it}^{*} = h_t(P_{iit}/\mathcal{E}_{it})$
   - — DCP: given export prices, MP cannot affect exports $Y_{it}^{*} = h_t(P_{it}^{*})$

Optimal Policy

Proposition (Non-U.S. policy)

The optimal monetary policy in a non-U.S. economy stabilizes prices of domestic producers $\pi_{iit} = 0$. *The resulting allocation is not efficient.*

1. Optimal policy can be summarized with a simple "sufficient statistic"
    - invariant to parameters/details of the model
2. PPI vs. CPI: target prices that are sticky in *local currency* ▸ show
    - may include retail prices of imported goods
3. Optimal policy is time consistent
4. Same optimal policy as under PCP despite inefficient outcome: ▸ show
    - PCP: given export prices, MP achieves optimal exports $Y^*_{it} = h_t(P_{iit}/\mathcal{E}_{it})$
    - DCP: given export prices, MP cannot affect exports $Y^*_{it} = h_t(P^*_{it})$
    - **Lemma:** decentralized export prices are constrained efficient under DCP
    - robust to Kimball demand, heterogenous firms, endogenous currency choice

Global Monetary Cycle

- Does targeting $\pi_{iit} = 0$ means the optimal policy is *inward-looking*?

$$1 = MC_{it} = \frac{G(W_{it}, P_{it})}{A_{it}}$$

Global Monetary Cycle

- Does targeting $\pi_{iit} = 0$ means the optimal policy is *inward-looking*?

$$1 = MC_{it} = \frac{G(W_{it}, P_{it})}{A_{it}}$$

- **Corollary**: The optimal policy is generically outward-looking

$$i_{USt} \uparrow \Rightarrow \ \mathcal{E}_{it} \uparrow \Rightarrow \left\{ \begin{array}{l} P_{it} \uparrow \Rightarrow \{\text{intermediates}\} \Rightarrow \ MC_{it} \uparrow \Rightarrow \ i_{it} \uparrow \\ \\ \end{array} \right.$$

Global Monetary Cycle

- Does targeting $\pi_{iit} = 0$ means the optimal policy is *inward-looking*?

$$1 = MC_{it} = \frac{G(W_{it}, P_{it})}{A_{it}}$$

- **Corollary**: The optimal policy is generically outward-looking

$$i_{USt} \uparrow \Rightarrow \ \mathcal{E}_{it} \uparrow \Rightarrow \left\{ \begin{array}{l} P_{it} \uparrow \Rightarrow \{\text{intermediates}\} \Rightarrow \ MC_{it} \uparrow \Rightarrow \ i_{it} \uparrow \\ Y^*_{it} \downarrow \Rightarrow \ \{\text{convex costs}\} \Rightarrow \ MC_{it} \downarrow \Rightarrow \ i_{it} \downarrow \end{array} \right.$$

Global Monetary Cycle

- Does targeting $\pi_{iit} = 0$ means the optimal policy is *inward-looking*?

$$1 = MC_{it} = \frac{G(W_{it}, P_{it})}{A_{it}}$$

- **Corollary**: The optimal policy is generically outward-looking

$$i_{USt} \uparrow \Rightarrow \; \mathcal{E}_{it} \uparrow \Rightarrow \begin{cases} P_{it} \uparrow \Rightarrow \{\text{intermediates}\} \Rightarrow \; MC_{it} \uparrow \Rightarrow \; i_{it} \uparrow \\ Y^*_{it} \downarrow \Rightarrow \; \{\text{convex costs}\} \Rightarrow \; MC_{it} \downarrow \Rightarrow \; i_{it} \downarrow \end{cases}$$

  i) Global Monetary Cycle: all countries respond to U.S. shocks

  — higher pass-through in countries with more DCP ▸ Zhang'2018

Global Monetary Cycle

- Does targeting $\pi_{iit} = 0$ means the optimal policy is *inward-looking*?

$$1 = MC_{it} = \frac{G(W_{it}, P_{it})}{A_{it}}$$

- **Corollary**: The optimal policy is generically outward-looking

$$i_{USt} \uparrow \Rightarrow \; \mathcal{E}_{it} \uparrow \Rightarrow \begin{cases} P_{it} \uparrow \Rightarrow \{\text{intermediates}\} \Rightarrow \; MC_{it} \uparrow \Rightarrow \; i_{it} \uparrow \; \Rightarrow \; \mathcal{E}_{it} \downarrow \\ Y^*_{it} \downarrow \Rightarrow \{\text{convex costs}\} \Rightarrow \; MC_{it} \downarrow \Rightarrow \; i_{it} \downarrow \; \Rightarrow \; \mathcal{E}_{it} \uparrow \end{cases}$$

i) Global Monetary Cycle: all countries respond to U.S. shocks

— higher pass-through in countries with more DCP ▸ Zhang'2018

ii) partial peg to the dollar if the intermediate channel dominates

— DCP contributes to the "fear of floating" ▸ IRR'2018

Global Monetary Cycle

- Does targeting $\pi_{iit} = 0$ means the optimal policy is *inward-looking*?

$$1 = MC_{it} = \frac{G(W_{it}, P_{it})}{A_{it}}$$

- **Corollary**: The optimal policy is generically outward-looking

$$i_{USt} \uparrow \Rightarrow \; \mathcal{E}_{it} \uparrow \Rightarrow \begin{cases} P_{it} \uparrow \Rightarrow \{\text{intermediates}\} \Rightarrow \; MC_{it} \uparrow \Rightarrow \; i_{it} \uparrow \; \Rightarrow \; \mathcal{E}_{it} \downarrow \\ Y^*_{it} \downarrow \Rightarrow \; \{\text{convex costs}\} \Rightarrow \; MC_{it} \downarrow \Rightarrow \; i_{it} \downarrow \; \Rightarrow \; \mathcal{E}_{it} \uparrow \end{cases}$$

i) Global Monetary Cycle: all countries respond to U.S. shocks

— higher pass-through in countries with more DCP ▸ Zhang'2018

ii) partial peg to the dollar if the intermediate channel dominates

— DCP contributes to the "fear of floating" ▸ IRR'2018

iii) Trilemma: trade-off is worse under DCP, but fixed ER is suboptimal

— *cf.* Rey'2013, Gourinchas'2018, Kalemli-Ozcan'2019

ADDITIONAL FISCAL INSTRUMENTS

Capital Controls

- Can capital controls insulate from U.S. spillovers?

Capital Controls

- Can capital controls insulate from U.S. spillovers?
    - Blanchard'2017: "*[the use of capital controls by EMs] allows AEs to use monetary policy to increase domestic demand, while shielding EMs of the undesirable exchange rate effects*"
    - Farhi-Werning'2016: if MP cannot achieve the first best under sticky prices, the risk sharing is generically inefficient due to "AD externality"

Capital Controls

- Can capital controls insulate from U.S. spillovers?
  - Blanchard'2017: "*[the use of capital controls by EMs] allows AEs to use monetary policy to increase domestic demand, while shielding EMs of the undesirable exchange rate effects*"
  - Farhi-Werning'2016: if MP cannot achieve the first best under sticky prices, the risk sharing is generically inefficient due to "AD externality"
- Augment monetary policy with state-contingent capital controls ▸ show

Proposition (Capital controls)

Given the optimal monetary policy, capital controls do not insulate other economies from U.S. spillovers and are not used by the planner.

Capital Controls

- Can capital controls insulate from U.S. spillovers?
  - Blanchard'2017: "*[the use of capital controls by EMs] allows AEs to use monetary policy to increase domestic demand, while shielding EMs of the undesirable exchange rate effects*"
  - Farhi-Werning'2016: if MP cannot achieve the first best under sticky prices, the risk sharing is generically inefficient due to "AD externality"
- Augment monetary policy with state-contingent capital controls ▸ show

Proposition (Capital controls)

Given the optimal monetary policy, capital controls do not insulate other economies from U.S. spillovers and are not used by the planner.

- Optimal subsidy from Farhi-Werning'2016:

$$\tau_{it}^{h} = P_{iit} C_{I,iit} \bar{\tau}_{iit} \; + \; \mathcal{E}_{it} P_{it}^{*} C_{I,it}^{*} \bar{\tau}_{it}^{*}$$

Capital Controls

- Can capital controls insulate from U.S. spillovers?
  - — Blanchard'2017: "*[the use of capital controls by EMs] allows AEs to use monetary policy to increase domestic demand, while shielding EMs of the undesirable exchange rate effects*"
  - — Farhi-Werning'2016: if MP cannot achieve the first best under sticky prices, the risk sharing is generically inefficient due to "AD externality"
- Augment monetary policy with state-contingent capital controls ▸ show

Proposition (Capital controls)

Given the optimal monetary policy, capital controls do not insulate other economies from U.S. spillovers and are not used by the planner.

- Optimal subsidy from Farhi-Werning'2016:

$$\tau_{it}^{h} = P_{iit} C_{I,iit} \underbrace{\bar{\tau}_{iit}}_{=0} + \mathcal{E}_{it} P_{it}^{*} C_{I,it}^{*} \underbrace{\bar{\tau}_{it}^{*}}_{\neq 0}$$

Capital Controls

- Can capital controls insulate from U.S. spillovers?
  - Blanchard'2017: "*[the use of capital controls by EMs] allows AEs to use monetary policy to increase domestic demand, while shielding EMs of the undesirable exchange rate effects*"
  - Farhi-Werning'2016: if MP cannot achieve the first best under sticky prices, the risk sharing is generically inefficient due to "AD externality"
- Augment monetary policy with state-contingent capital controls ▸ show

Proposition (Capital controls)

Given the optimal monetary policy, capital controls do not insulate other economies from U.S. spillovers and are not used by the planner.

- Optimal subsidy from Farhi-Werning'2016:

$$\tau^h_{it} = P_{iit} \underbrace{C_{I,iit}}_{>0} \underbrace{\bar{\tau}_{iit}}_{=0} + \mathcal{E}_{it} P^*_{it} \underbrace{C^*_{I,it}}_{=0} \underbrace{\bar{\tau}^*_{it}}_{\neq 0}$$

Capital Controls

- Can capital controls insulate from U.S. spillovers?
  - — Blanchard'2017: "*[the use of capital controls by EMs] allows AEs to use monetary policy to increase domestic demand, while shielding EMs of the undesirable exchange rate effects*"
  - — Farhi-Werning'2016: if MP cannot achieve the first best under sticky prices, the risk sharing is generically inefficient due to "AD externality"
- Augment monetary policy with state-contingent capital controls ▸ show

Proposition (Capital controls)

Given the optimal monetary policy, capital controls do not insulate other economies from U.S. spillovers and are not used by the planner.

- Optimal subsidy from Farhi-Werning'2016:

$$\tau_{it}^{h} = P_{iit}\underbrace{C_{I,iit}}_{>0}\underbrace{\bar{\tau}_{iit}}_{=0} + \mathcal{E}_{it}P_{it}^{*}\underbrace{C_{I,it}^{*}}_{=0}\underbrace{\bar{\tau}_{it}^{*}}_{\neq 0}$$

⇒ capital controls are not a panacea against all kinds of foreign spillovers

Capital Controls

- Can capital controls insulate from U.S. spillovers?
  - Blanchard’2017: “*[the use of capital controls by EMs] allows AEs to use monetary policy to increase domestic demand, while shielding EMs of the undesirable exchange rate effects*”
  - Farhi-Werning’2016: if MP cannot achieve the first best under sticky prices, the risk sharing is generically inefficient due to “AD externality”
- Augment monetary policy with state-contingent capital controls ▸ show

Proposition (Capital controls)

Given the optimal monetary policy, capital controls do not insulate other economies from U.S. spillovers and are not used by the planner.

- Optimal subsidy from Farhi-Werning’2016:

$$\tau^h_{it} = P_{iit} \underbrace{C_{I,iit}}_{>0} \underbrace{\bar{\tau}_{iit}}_{=0} + \mathcal{E}_{it} P^*_{it} \underbrace{C^*_{I,it}}_{=0} \underbrace{\bar{\tau}^*_{it}}_{\neq 0}$$

- **Corollary**: The optimal cooperative capital controls are generically non-zero and target economies that import depressed/overheated goods

Trade Tariffs

- Can trade policy overcome limitations of MP and capital controls?
  - fiscal policy can replicate effects of monetary depreciation (Adao-Correia-Teles'2009, Farhi-Gopinath-Itskhoki'2014)
  - fiscal policy can restore efficient allocation under LCP (Chen-Devereux-Xu-Shi'2018)

Trade Tariffs

- Can trade policy overcome limitations of MP and capital controls?
  - fiscal policy can replicate effects of monetary depreciation (Adao-Correia-Teles'2009, Farhi-Gopinath-Itskhoki'2014)
  - fiscal policy can restore efficient allocation under LCP (Chen-Devereux-Xu-Shi'2018)

- **Lemma**: The non-cooperative first-best allocation can be implemented with
  1. monetary policy stabilizing P_{iit}
  2. export tax τ_{it}^{E} stabilizing $\tau_{it}^{E}\mathcal{E}_{it}P_{it}^{*}$
  3. production subsidy to exporters τ_{it}^{*} stabilizing P_{it}^{*}

Trade Tariffs

- Can trade policy overcome limitations of MP and capital controls?
  - — fiscal policy can replicate effects of monetary depreciation (Adao-Correia-Teles'2009, Farhi-Gopinath-Itskhoki'2014)
  - — fiscal policy can restore efficient allocation under LCP (Chen-Devereux-Xu-Shi'2018)

- **Lemma**: The non-cooperative first-best allocation can be implemented with
  1. monetary policy stabilizing P_{iit} $\Rightarrow$ *domestic margin*
  2. export tax τ^E_{it} stabilizing $\tau^E_{it}\mathcal{E}_{it}P^*_{it}$ $\Rightarrow$ *expenditure switching*
  3. production subsidy to exporters τ^*_{it} stabilizing P^*_{it} $\Rightarrow$ *price-adj. costs*

Trade Tariffs

- Can trade policy overcome limitations of MP and capital controls?
  - fiscal policy can replicate effects of monetary depreciation (Adao-Correia-Teles'2009, Farhi-Gopinath-Itskhoki'2014)
  - fiscal policy can restore efficient allocation under LCP (Chen-Devereux-Xu-Shi'2018)

- **Lemma**: The non-cooperative first-best allocation can be implemented with
  1. monetary policy stabilizing P_{iit} $\Rightarrow$ *domestic margin*
  2. export tax τ^E_{it} stabilizing $\tau^E_{it}\mathcal{E}_{it}P^*_{it}$ $\Rightarrow$ *expenditure switching*
  3. production subsidy to exporters τ^*_{it} stabilizing P^*_{it} $\Rightarrow$ *price-adj. costs*

- The optimal policy is "robust" in terms of targets (cf. FGI'2014)
  - invariant to parameters/details of the model

Trade Tariffs

- Can trade policy overcome limitations of MP and capital controls?
  - fiscal policy can replicate effects of monetary depreciation (Adao-Correia-Teles'2009, Farhi-Gopinath-Itskhoki'2014)
  - fiscal policy can restore efficient allocation under LCP (Chen-Devereux-Xu-Shi'2018)

- **Lemma**: The non-cooperative first-best allocation can be implemented with
  1. monetary policy stabilizing P_{iit} $\Rightarrow$ *domestic margin*
  2. export tax τ^E_{it} stabilizing $\tau^E_{it}\mathcal{E}_{it}P^*_{it}$ $\Rightarrow$ *expenditure switching*
  3. production subsidy to exporters τ^*_{it} stabilizing P^*_{it} $\Rightarrow$ *price-adj. costs*

- The optimal policy is "robust" in terms of targets (cf. FGI'2014)
  - invariant to parameters/details of the model

- Can be implemented with alternative instruments...
  - but export tax is crucial as the Lerner symmetry does not hold (Barbiero-Farhi-Gopinath-Itskhoki'2019)

OPTIMAL U.S. POLICY

U.S. Policy and Welfare

Proposition (U.S. policy)

Assume fully sticky prices and complete markets. Then optimal U.S. monetary policy rule balances three motives:

$$\Gamma \cdot p_{iit} + \gamma \Xi \cdot \int p^*_{jt} \mathrm{d}j + \gamma \epsilon \cdot nx_{it} = 0.$$

U.S. Policy and Welfare

Proposition (U.S. policy)

Assume fully sticky prices and complete markets. Then optimal U.S. monetary policy rule balances three motives:

$$\Gamma \cdot p_{iit} + \gamma \Xi \cdot \int p_{jt}^{*} \mathrm{d}j + \gamma \epsilon \cdot nx_{it} = 0.$$

1. Price targeting: domestic demand and expenditure switching for exports

U.S. Policy and Welfare

Proposition (U.S. policy)

Assume fully sticky prices and complete markets. Then optimal U.S. monetary policy rule balances three motives:

$$\Gamma \cdot p_{iit} + \gamma \Xi \cdot \int p^*_{jt} \mathrm{d} j + \gamma \epsilon \cdot nx_{it} = 0.$$

1. Price targeting: domestic demand and expenditure switching for exports
2. ToT manipulation: markups of world exporters depend on U.S. policy

U.S. Policy and Welfare

Proposition (U.S. policy)

Assume fully sticky prices and complete markets. Then optimal U.S. monetary policy rule balances three motives:

$$\Gamma \cdot p_{iit} + \gamma \Xi \cdot \int p^*_{jt} \mathrm{d}j + \gamma \epsilon \cdot nx_{it} = 0.$$

1. Price targeting: domestic demand and expenditure switching for exports
2. ToT manipulation: markups of world exporters depend on U.S. policy
3. Dynamic ToT manipulation: borrow cheaply and save at higher rate
    - as if U.S. economy is large (cf. Costinot-Lorenzoni-Werning'2014)
    - if $\epsilon < 0$, the U.S. overstimulates the economy when $nx_{it} < 0$

U.S. Policy and Welfare

Proposition (U.S. policy)

Assume fully sticky prices and complete markets. Then optimal U.S. monetary policy rule balances three motives:

$$\Gamma \cdot p_{iit} + \gamma \Xi \cdot \int p^*_{jt} \mathrm{d}j + \gamma \epsilon \cdot nx_{it} = 0.$$

1. Price targeting: domestic demand and expenditure switching for exports
2. ToT manipulation: markups of world exporters depend on U.S. policy
3. Dynamic ToT manipulation: borrow cheaply and save at higher rate
   - — as if U.S. economy is large (cf. Costinot-Lorenzoni-Werning'2014)
   - — if $\epsilon < 0$, the U.S. overstimulates the economy when $nx_{it} < 0$

- General case: the U.S. can benefit or lose from DCP relative to RoW

U.S. Policy and Welfare

Proposition (U.S. policy)

Assume fully sticky prices and complete markets. Then optimal U.S. monetary policy rule balances three motives:

$$\Gamma \cdot p_{iit} + \gamma\Xi \cdot \int p^*_{jt}\mathrm{d}j + \gamma\epsilon \cdot nx_{it} = 0.$$

1. Price targeting: domestic demand and expenditure switching for exports
2. ToT manipulation: markups of world exporters depend on U.S. policy
3. Dynamic ToT manipulation: borrow cheaply and save at higher rate
    - as if U.S. economy is large (cf. Costinot-Lorenzoni-Werning'2014)
    - if $\epsilon < 0$, the U.S. overstimulates the economy when $nx_{it} < 0$

- General case: the U.S. can benefit or lose from DCP relative to RoW
- Special case: complete markets + log-linear preferences + no intermediates

Proposition (Welfare)

In the special case, if countries' openness γ is sufficiently low, then the welfare of the U.S. under DCP is higher relative to other countries.

Cooperative Policy

- Global planner maximizes total welfare across countries
  - *U.S. welfare* is a trivial fraction of global welfare
  - *U.S. monetary policy* has global effects

Cooperative Policy

- Global planner maximizes total welfare across countries
  - *U.S. welfare* is a trivial fraction of global welfare
  - *U.S. monetary policy* has global effects

Proposition (Cooperative policy)

Assume complete asset markets and $\tau_i^* = \tau_i = \frac{\varepsilon-1}{\varepsilon}$. *Then the optimal cooperative policy implements*

$$\pi_{iit} = 0, \ \forall i \neq U.S. \qquad and \qquad \int \varpi_{it} \cdot \frac{P_{iit}}{\mathcal{E}_{it} P_{it}^*} \mathrm{d}i = 1, \quad \varpi_{it} \equiv \left(\frac{P_{it}^*}{P_t^*} \right)^{\varepsilon-1}.$$

Cooperative Policy

- Global planner maximizes total welfare across countries
  - *U.S. welfare* is a trivial fraction of global welfare
  - *U.S. monetary policy* has global effects

Proposition (Cooperative policy)

Assume complete asset markets and $\tau_i^* = \tau_i = \frac{\varepsilon-1}{\varepsilon}$. *Then the optimal cooperative policy implements*

$$\pi_{iit} = 0,\ \forall i \neq U.S. \qquad \textit{and} \qquad \int \varpi_{it} \cdot \frac{P_{iit}}{\mathcal{E}_{it} P_{it}^*} \mathrm{d}i = 1, \quad \varpi_{it} \equiv \left(\frac{P_{it}^*}{P_t^*} \right)^{\varepsilon-1}.$$

- Monetary cooperation harms the U.S. and benefits the RoW:
  - country-specific shocks $\Rightarrow$ conflict of interests, no first-best
  - common shocks $\Rightarrow$ cooperation $=$ non-cooperation $=$ first-best

Cooperative Policy

- Global planner maximizes total welfare across countries
  - *U.S. welfare* is a trivial fraction of global welfare
  - *U.S. monetary policy* has global effects

Proposition (Cooperative policy)

Assume complete asset markets and $\tau_i^* = \tau_i = \frac{\varepsilon-1}{\varepsilon}$. *Then the optimal cooperative policy implements*

$$\pi_{iit} = 0,\ \forall i \neq U.S. \qquad \text{and} \qquad \int \varpi_{it} \cdot \frac{P_{iit}}{\mathcal{E}_{it} P_{it}^*} \mathrm{d}i = 1, \quad \varpi_{it} \equiv \left(\frac{P_{it}^*}{P_t^*} \right)^{\varepsilon-1}.$$

- Monetary cooperation harms the U.S. and benefits the RoW:
  - country-specific shocks ⇒ conflict of interests, no first-best
  - common shocks ⇒ cooperation = non-cooperation = first-best
- **Corollary**: forming currency union can benefit its members

Conclusion

1. **Optimality of Inflation Targeting**

    — robust and simple non-U.S. policy despite inefficient ToT & output gap

2. **Global Monetary Cycle**

    — "fear of floating" and *partial* peg to the dollar

3. **No Case for Capital Controls**

    — inefficient against U.S. spillovers despite AD externalities

4. **Motives of U.S. Policy**

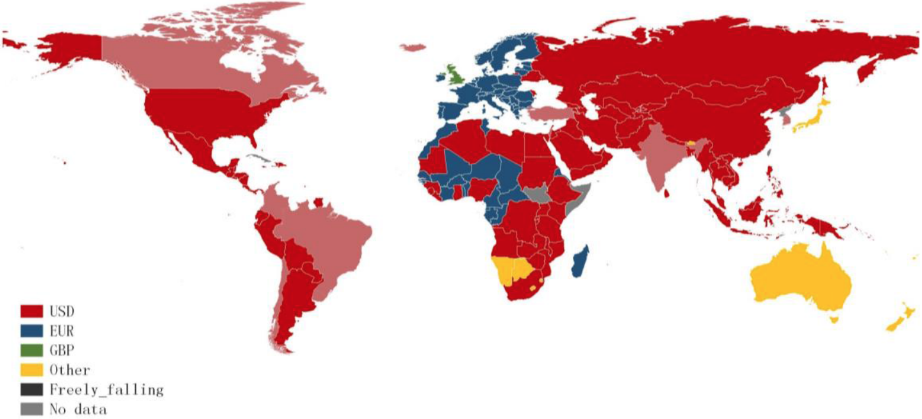
    — optimal to partially internalize spillovers on the RoW

5. **Benefits from Cooperation**

    — currency union as a substitute for unsustainable global cooperation

APPENDIX

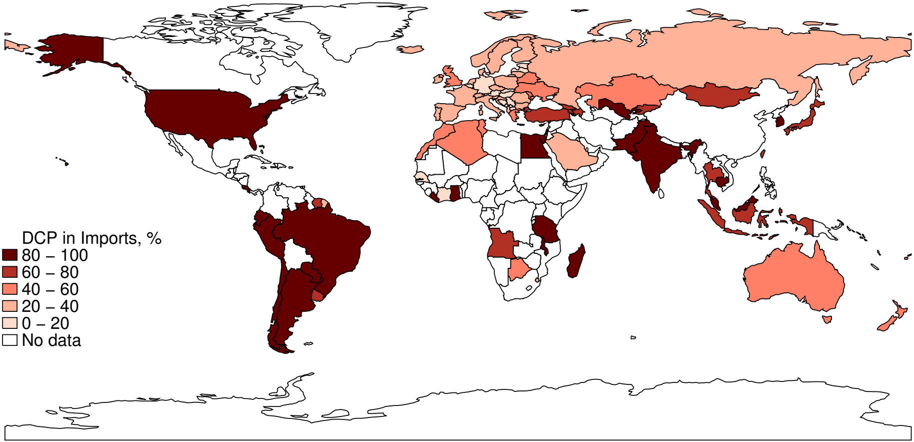
Dollar as an Anchor Currency



Source: Ilzetzki, Reinhart and Rogoff (2017)

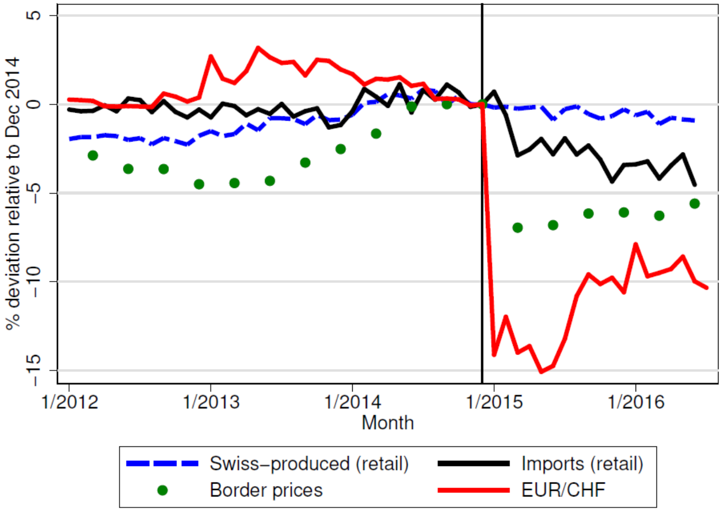
▸ Motivation ▸ GMC

DCP in Imports



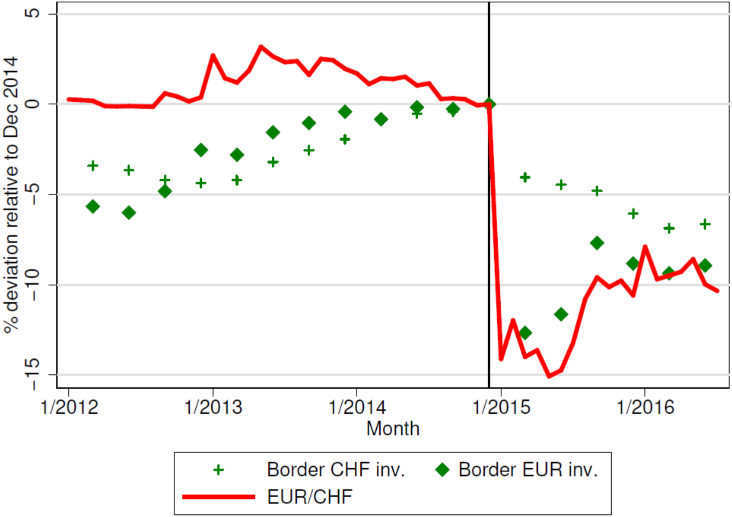
Source: Boz et al. (2020)

Pass-Through into Border and Retail Prices



Source: Auer, Burstein, and Lein (2018)

Pass-Through into Border and Retail Prices



Source: Auer, Burstein, and Lein (2018)

back

Households

- Preferences:

$$\mathbb{E} \sum_{t=0}^{\infty} \beta^t U\left(C_{it}, N_{it}, \xi_{it}\right)$$

- Consumption aggregator:

$$C_{it} = \left[(1-\gamma)^{\frac{1}{\theta}} C_{iit}^{\frac{\theta-1}{\theta}} + \gamma^{\frac{1}{\theta}} C_{it}^{*\,\frac{\theta-1}{\theta}}\right]^{\frac{\theta}{\theta-1}}, \quad C_{it}^{*} = \left(\int C_{jit}^{\frac{\varepsilon-1}{\varepsilon}} \mathrm{d}j\right)^{\frac{\varepsilon}{\varepsilon-1}}$$

  - macro elasticity θ vs. micro elasticity $\varepsilon > 1$

- Budget constraint:

$$P_{it} C_{it} + \mathcal{E}_{it} \sum_{h \in H_{it}} \mathcal{Q}_t^h B_{it+1}^h = W_{it} N_{it} + \Pi_{it} + \mathcal{E}_{it} \sum_{h \in H_{it-1}} (\mathcal{Q}_t^h + D_t^h) B_{it}^h + \mathcal{E}_{it} \psi_{it}$$

  - $\mathcal{E}_{it}$ is the nominal exchange rate against the dollar
  - H_{it} is an arbitrary set of traded assets
  - ψ_{it} is a commodity/ToT/wealth/financial shock

back

Firms

- CRS technology:

$$Y_{it} = A_{it} F(L_{it}, X_{it})$$

  — for simplicity, same bundle of intermediates X_{it} as in consumption

- Rotemberg price setting:

  1. **Local currency** in domestic market:

$$\max_{\{P_t\}} \mathbb{E} \sum_{t=0}^{\infty} \Theta_{it} \left[\left(P_t - \tau_i MC_{it}\right) \left(\frac{P_t}{P_{iit}}\right)^{-\varepsilon} Y_{iit} - (1-\gamma)\frac{\varphi}{2}\left(\frac{P_t}{P_{t-1}} - 1\right)^2 W_{it} \right]$$

  2. **Dollars** in foreign markets:

$$\max_{\{P_t\}} \mathbb{E} \sum_{t=0}^{\infty} \Theta_{it} \left[\left(\mathcal{E}_{it} P_t - \tau_i^* MC_{it}\right) \left(\frac{P_t}{P_{it}^*}\right)^{-\varepsilon} Y_{it}^* \quad - \quad \gamma \frac{\varphi}{2}\left(\frac{P_t}{P_{t-1}} - 1\right)^2 W_{it} \right]$$

  — $\Theta_{it} \equiv \beta^t \frac{U_{Cit}}{P_{it}}$ is the nominal SDF

  — $Y_{iit} \equiv C_{iit} + X_{iit}$ and $Y_{it}^* \equiv \int \left(C_{ijt} + X_{ijt}\right) \mathrm{d}j$ are demand shifters

  — τ_i and τ_i^* are time-invariant subsidies to domestic firms and exporters

▸ back

Market Clearing

- Goods market:

$$A_{it}F(L_{it},X_{it}) = (1-\gamma)\left(\frac{P_{iit}}{P_{it}}\right)^{-\theta}(C_{it}+X_{it})+\gamma\left(\frac{P^*_{it}}{P^*_t}\right)^{-\varepsilon}\int\left(\frac{\mathcal{E}_{jt}P^*_t}{P_{jt}}\right)^{-\theta}(C_{jt}+X_{jt})\,\mathrm{d}j$$

- Labor market:

$$N_{it} = L_{it} + \frac{\varphi}{2}(1-\gamma)\pi^2_{iit} + \frac{\varphi}{2}\gamma\pi^{*2}_{it}$$

- Asset markets:

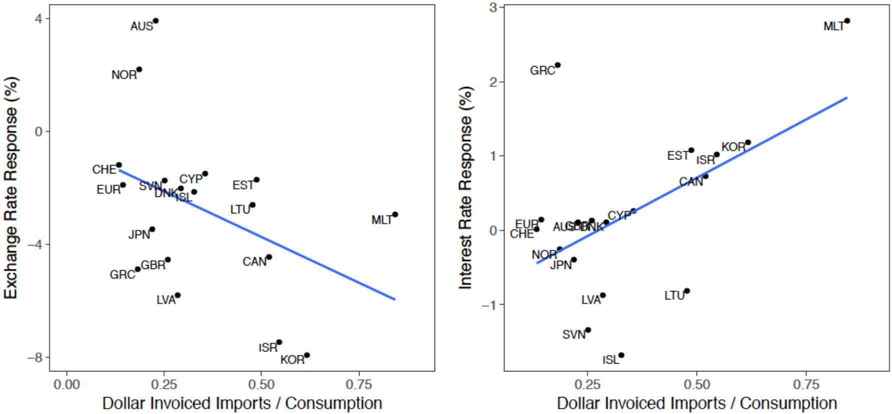
$$\int B^h_{it+1}\mathrm{d}i = 0, \ \ \forall h \in H_t, \qquad \mathcal{B}^i_{it} = 0$$

- Country's budget constraint:

$$\sum_{h\in H_t}\mathcal{Q}^h_t B^h_{it+1} - \sum_{h\in H_{t-1}}(\mathcal{Q}^h_t + D^h_t)B^h_{it}$$
$$= \gamma\left[P^*_{it}\left(\frac{P^*_{it}}{P^*_t}\right)^{-\varepsilon}\int\left(\frac{\mathcal{E}_{jt}P^*_t}{P_{jt}}\right)^{-\theta}(C_{jt}+X_{jt})\,\mathrm{d}j - P^*_t\left(\frac{\mathcal{E}_{it}P^*_t}{P_{it}}\right)^{-\theta}(C_{it}+X_{it})\right] + \psi_{it}.$$

back

DCP vs. Response to Fed's Shocks



Source: Zhang (2018)

▸ GMC

Comparison to the Literature

<table>
<tr><th></th><th>DSX</th><th>CP</th><th>GT</th><th>CDGG</th><th>EM</th></tr>
<tr><td colspan="6">Environment:</td></tr>
<tr><td># of countries</td><td colspan="2">two</td><td>three</td><td>SOE</td><td>continuum</td></tr>
<tr><td>preferences</td><td colspan="4">log-linear</td><td>general</td></tr>
<tr><td>intermediates</td><td colspan="4">no</td><td>yes</td></tr>
<tr><td>asset markets</td><td colspan="4">complete</td><td>arbitrary</td></tr>
<tr><td>prices</td><td colspan="3">fully sticky</td><td>Calvo</td><td>Rtmberg/Calvo</td></tr>
<tr><td>terms-of-trade</td><td colspan="4">exogenous to MP</td><td>endogenous</td></tr>
<tr><td>currency choice</td><td>rationalized</td><td colspan="3">exogenous</td><td>endogenous</td></tr>
<tr><td colspan="6">Non-U.S. policy:</td></tr>
<tr><td>optimal target</td><td colspan="5">price stabilization</td></tr>
<tr><td>allocation</td><td colspan="5">inefficient</td></tr>
<tr><td>implementation</td><td colspan="4">inward-looking</td><td>outward-looking</td></tr>
<tr><td>exchange rates</td><td colspan="4">floating</td><td>partial peg</td></tr>
<tr><td>capital contols</td><td colspan="4">—</td><td>inefficient</td></tr>
<tr><td>trade policy</td><td colspan="4">—</td><td>efficient</td></tr>
<tr><td colspan="6">U.S. policy motives:</td></tr>
<tr><td>import prices</td><td colspan="3">yes</td><td>—</td><td>yes</td></tr>
<tr><td>dynamic ToT</td><td colspan="3">no</td><td>—</td><td>yes</td></tr>
<tr><td>welfare effects</td><td>negative</td><td>—</td><td>ambiguous</td><td>—</td><td>ambiguous</td></tr>
<tr><td>cooperative policy</td><td colspan="3">yes</td><td>—</td><td>yes</td></tr>
</table>

Papers: Devereux, Shi & Xu (2007), Corsetti & Pesenti (2007), Goldberg & Tille (2009), Casas, Diez, Gopinath & Gourinchas (2018), Egorov & Mukhin (2019) ▸ back

Non-U.S. Planner's Problem

$$\max_{\{\mathcal{E}_{it}, B^h_{it}, C_{it}, L_{it}, \pi_{iit}, \pi^*_{it}\}} \mathbb{E} \sum_{t=0}^{\infty} \beta^t U\Big(C_{it}, L_{it} + \frac{\varphi}{2}(1-\gamma)\pi^2_{iit} + \frac{\varphi}{2}\gamma\pi^{*2}_{it}, \xi_{it}\Big)$$

$$\text{(RS)} \quad \mathbb{E}_t \Theta_{it,t+1} \frac{\mathcal{E}_{it+1}}{\mathcal{E}_{it}} \frac{\mathcal{Q}^h_{t+1} + D^h_{t+1}}{\mathcal{Q}^h_t} = 1$$

$$\text{(BC)} \quad \sum_{h \in H_t} \mathcal{Q}^h_t B^h_{it+1} - \sum_{h \in H_{t-1}} (\mathcal{Q}^h_t + D^h_t) B^h_{it}$$

$$= \gamma \left[P^*_{it} \left(\frac{P^*_{it}}{P^*_t} \right)^{-\varepsilon} \int \left(\frac{\mathcal{E}_{jt} P^*_t}{P_{jt}} \right)^{-\theta} (C_{jt} + X_{jt})\, \mathrm{d}j - P^*_t \left(\frac{\mathcal{E}_{it} P^*_t}{P_{it}} \right)^{-\theta} (C_{it} + X_{it}) \right] + \psi_{it}$$

$$\text{(MC)} \quad A_{it} F(L_{it}, X_{it}) = (1-\gamma) \left(\frac{P_{iit}}{P_{it}} \right)^{-\theta} (C_{it} + X_{it}) + \gamma \left(\frac{P^*_{it}}{P^*_t} \right)^{-\varepsilon} \int \left(\frac{\mathcal{E}_{jt} P^*_t}{P_{jt}} \right)^{-\theta} (C_{jt} + X_{jt})\, \mathrm{d}j$$

$$\text{(PC)} \quad \pi_{iit} (\pi_{iit} + 1) W_{it} = -\kappa \left(P_{iit} - \frac{\varepsilon \tau_i}{\varepsilon - 1} MC_{it} \right) \frac{Y_{iit}}{1-\gamma} + \beta \mathbb{E}_t \Theta_{it,t+1} \pi_{iit+1} (\pi_{iit+1} + 1) W_{it+1}$$

$$\text{(PC)} \quad \pi^*_{it} (\pi^*_{it} + 1) W_{it} = -\kappa \left(\mathcal{E}_{it} P^*_{it} - \frac{\varepsilon \tau^*_i}{\varepsilon - 1} MC_{it} \right) \frac{Y^*_{it}}{\gamma} + \beta \mathbb{E}_t \Theta_{it,t+1} \pi^*_{it+1} (\pi^*_{it+1} + 1) W_{it+1}$$

$$\text{where } \frac{X_{it}}{L_{it}} = g\left(\frac{-U_{Nit}}{U_{Cit}} \right), \ \Theta_{it,t+\tau} = \beta^\tau \frac{U_{Cit+\tau} P_{it}}{U_{Cit} P_{it+\tau}}, \ \frac{MC_{it}}{P_{it}} = \frac{h\left(\frac{-U_{Nit}}{U_{Cit}}\right)}{A_{it}}, \ Y^*_{it} \equiv \int (C_{ijt} + X_{ijt})\mathrm{d}j$$

▸ back

Planner's Problem w/ Capital Controls

$$\max_{\{\mathcal{E}_{it},\tau^h_{it+1},B^h_{it},C_{it},L_{it},\pi_{iit},\pi^*_{it}\}} \mathbb{E}\sum_{t=0}^{\infty}\beta^t U\left(C_{it}, L_{it}+\frac{\varphi}{2}(1-\gamma)\pi_{iit}^2+\frac{\varphi}{2}\gamma\pi_{it}^{*2},\xi_{it}\right)$$

$$\text{(RS)}\quad \mathbb{E}_t\Theta_{it,t+1}\frac{\mathcal{E}_{it+1}}{\mathcal{E}_{it}}\frac{\mathcal{Q}^h_{t+1}+D^h_{t+1}}{(1-\tau^h_{it+1})\mathcal{Q}^h_t}=1$$

$$\text{(BC)}\quad \sum_{h\in H_t}\mathcal{Q}^h_t B^h_{it+1}-\sum_{h\in H_{t-1}}(\mathcal{Q}^h_t+D^h_t)B^h_{it}$$

$$=\gamma\left[P^*_{it}\left(\frac{P^*_{it}}{P^*_t}\right)^{-\varepsilon}\int\left(\frac{\mathcal{E}_{jt}P^*_t}{P_{jt}}\right)^{-\theta}(C_{jt}+X_{jt})\,\mathrm{d}j-P^*_t\left(\frac{\mathcal{E}_{it}P^*_t}{P_{it}}\right)^{-\theta}(C_{it}+X_{it})\right]+\psi_{it}$$

$$\text{(MC)}\quad A_{it}F(L_{it},X_{it})=(1-\gamma)\left(\frac{P_{iit}}{P_{it}}\right)^{-\theta}(C_{it}+X_{it})+\gamma\left(\frac{P^*_{it}}{P^*_t}\right)^{-\varepsilon}\int\left(\frac{\mathcal{E}_{jt}P^*_t}{P_{jt}}\right)^{-\theta}(C_{jt}+X_{jt})\,\mathrm{d}j$$

$$\text{(PC)}\quad \pi_{iit}(\pi_{iit}+1)W_{it}=-\kappa\left(P_{iit}-\frac{\varepsilon\tau_i}{\varepsilon-1}MC_{it}\right)\frac{Y_{iit}}{1-\gamma}+\beta\mathbb{E}_t\Theta_{it,t+1}\pi_{iit+1}(\pi_{iit+1}+1)W_{it+1}$$

$$\text{(PC)}\quad \pi^*_{it}(\pi^*_{it}+1)W_{it}=-\kappa\left(\mathcal{E}_{it}P^*_{it}-\frac{\varepsilon\tau^*_i}{\varepsilon-1}MC_{it}\right)\frac{Y^*_{it}}{\gamma}+\beta\mathbb{E}_t\Theta_{it,t+1}\pi^*_{it+1}(\pi^*_{it+1}+1)W_{it+1}$$

$$\text{where }\frac{X_{it}}{L_{it}}=g\left(\frac{-U_{Nit}}{U_{Cit}}\right),\ \Theta_{it,t+\tau}=\beta^\tau\frac{U_{Cit+\tau}P_{it}}{U_{Cit}P_{it+\tau}},\ \frac{MC_{it}}{P_{it}}=\frac{h\left(\frac{-U_{Nit}}{U_{Cit}}\right)}{A_{it}},\ Y^*_{it}\equiv\int(C_{ijt}+X_{ijt})\mathrm{d}j$$

▸ back

Domestic Dollarization

- EMs often face dollarization of domestic prices (Drenik-Perez'18)
- Extend model to have both PCP and DCP in home market

Domestic Dollarization

- EMs often face dollarization of domestic prices (Drenik-Perez'18)
- Extend model to have both PCP and DCP in home market

Proposition (Domestic dollarization)

The optimal policy stabilizes local-currency prices $\pi_{iit} = 0$ *and imposes capital controls and export tariffs* $\tau^c_{it} \propto \mathcal{E}_{it} P^*_{iit} - P_{iit}$.

Domestic Dollarization

- EMs often face dollarization of domestic prices (Drenik-Perez'18)
- Extend model to have both PCP and DCP in home market

Proposition (Domestic dollarization)

The optimal policy stabilizes local-currency prices $\pi_{iit} = 0$ *and imposes capital controls and export tariffs* $\tau^c_{it} \propto \mathcal{E}_{it} P^*_{iit} - P_{iit}$.

1. Optimal monetary target:
    - currency of invoicing $\gg$ country of origin
2. Capital controls:
    - AD externality
    - subsidize assets that pay in states with $\mathcal{E}_{it} P^*_{iit} > P_{iit}$
3. Export tariffs:
    - AD externality
    - boost exports in states with $\mathcal{E}_{it} P^*_{iit} > P_{iit}$

back

Equilibrium

- Ramsey approach: nominal interest rates R_{it} as monetary instrument

back

Equilibrium

- Ramsey approach: nominal interest rates R_{it} as monetary instrument
- **Definition**: *solve for a SPNE of the following game*
  - *countries choose domestic inflation* π_{iit}
  - *the U.S. moves before other countries*
  - *full commitment*

back

Equilibrium

- Ramsey approach: nominal interest rates R_{it} as monetary instrument
- **Definition**: *solve for a SPNE of the following game*
  - *countries choose domestic inflation* π_{iit} → can choose $C_{it}, L_{it}, Y_{it}, \pi^*_{it}$
  - *the U.S. moves before other countries* → simultaneous-move game
  - *full commitment* → binds only for the U.S.
- **Lemma 1**: the same equilibrium in a large set of games

▸ back

Equilibrium

- Ramsey approach: nominal interest rates R_{it} as monetary instrument
- **Definition**: *solve for a SPNE of the following game*
  - — *countries choose domestic inflation* π_{iit} → can choose $C_{it}, L_{it}, Y_{it}, \pi^*_{it}$
  - — *the U.S. moves before other countries* → simultaneous-move game
  - — *full commitment* → binds only for the U.S.
- **Lemma 1**: the same equilibrium in a large set of games
- To isolate new policy motives assume:

  A1: production subsidies $\tau_i = \frac{\varepsilon - 1}{\varepsilon}$, $\tau^*_i = 1$ and no markup shocks
  $\Rightarrow$ *eliminate monopolistic distortion and the terms-of-trade externality*

  A2: payoffs of assets D^h_t are independent from monetary policies
  $\Rightarrow$ *monetary policy does not aim to complete asset markets*

▸ back

Equilibrium

- Ramsey approach: nominal interest rates R_{it} as monetary instrument
- **Definition**: *solve for a SPNE of the following game*
  - — *countries choose domestic inflation π_{iit}* → can choose $C_{it}, L_{it}, Y_{it}, \pi^*_{it}$
  - — *the U.S. moves before other countries* → simultaneous-move game
  - — *full commitment* → binds only for the U.S.
- **Lemma 1**: the same equilibrium in a large set of games
- To isolate new policy motives assume:

  A1: production subsidies $\tau_i = \frac{\varepsilon-1}{\varepsilon}$, $\tau^*_i = 1$ and no markup shocks

  ⇒ *eliminate monopolistic distortion and the terms-of-trade externality*

  A2: payoffs of assets D^h_t are independent from monetary policies

  ⇒ *monetary policy does not aim to complete asset markets*
- **Lemma 2**: the flexible-price equilibrium $\varphi = 0$
  - (a) is efficient from the perspective of individual country,
  - (b) can be implemented under PCP by targeting $\pi_{iit} = 0$.

▸ back

Intuition

- Consider a simplified setup:
  - one-period model
  - discretionary policy
  - no intermediates

Intuition

- Define local and external wedges :

$$\bar{\tau}_{ii} \equiv 1 + \frac{1}{A_i} \frac{U_{N_i}}{U_{C_{ii}}}, \qquad \bar{\tau}_i^* \equiv 1 + \frac{\varepsilon_i}{\varepsilon_i - 1} \frac{S_i}{A_i} \frac{U_{N_i}}{U_{C_i^*}}$$

Intuition

- Define local and external wedges :

$$\bar{\tau}_{ii} \equiv 1 + \frac{1}{A_i}\frac{U_{N_i}}{U_{C_{ii}}}, \qquad \bar{\tau}_i^* \equiv 1 + \frac{\varepsilon_i}{\varepsilon_i - 1}\frac{S_i}{A_i}\frac{U_{N_i}}{U_{C_i^*}}$$

- **Observation 1**: *given P_i^*, MP has no effect on exports*
  - distinguishes DCP from PCP

Intuition

- Define local and external wedges :

$$\bar{\tau}_{ii} \equiv 1 + \frac{1}{A_i} \frac{U_{N_i}}{U_{C_{ii}}}, \qquad \bar{\tau}_i^* \equiv 1 + \frac{\varepsilon_i}{\varepsilon_i - 1} \frac{S_i}{A_i} \frac{U_{N_i}}{U_{C_i^*}}$$

- **Observation 1**: *given P_i^*, MP has no effect on exports*
- **Observation 2**: *given $\bar{\tau}_{ii} = 0$, P_i^* is constrained efficient*
  - relaxed planner's problem:

$$\max_{C_{ii}, C_i^*, N_i, S_i} \quad U\big(C_{ii}, C_i^*, N_i\big)$$

$$\text{s.t.} \quad A_i N_i = C_{ii} + h(S_i^{-1}) C^* + A_i \pi(S_i^{-1})$$

$$C_i^* = S_i^{-1} h(S_i^{-1}) C^* + \sum_h D^h B_i^h + \psi_i$$

  - optimal export price coincides with the decentralized one:

$$S_i^{-1} = \operatorname*{argmax}_{S^{-1}} \left[\mathcal{E}_i S^{-1} - \frac{W_i}{A_i}\right] h(S^{-1}) C^* - \pi(S^{-1}) W_i$$

Robustness

- Optimal policy is robust to several extensions of the model:
  - Kimball demand and pricing-to-market
  - different technologies of local firms and exporters
  - Calvo friction and menu costs

Robustness

- Optimal policy is robust to several extensions of the model:
  - Kimball demand and pricing-to-market
  - different technologies of local firms and exporters
  - Calvo friction and menu costs

- **Counterexample**: externalities across exporters

$$Y^*_{it}(\omega) = h_t\big(P^*_{it}(\omega)\big)$$

Robustness

- Optimal policy is robust to several extensions of the model:
  - Kimball demand and pricing-to-market
  - different technologies of local firms and exporters
  - Calvo friction and menu costs

- **Counterexample**: externalities across exporters

$$Y_{it}^*(\omega) = h_t\big(P_{it}^*(\omega), P_{it}^*\big) \overset{\text{e.g.}}{=} \left(\frac{P_{it}^*(\omega)}{P_{it}^*}\right)^{-\varepsilon} \left(\frac{P_{it}^*}{P_t^*}\right)^{-\rho} D_t^*$$

Robustness

- Optimal policy is robust to several extensions of the model:
  - Kimball demand and pricing-to-market
  - different technologies of local firms and exporters
  - Calvo friction and menu costs

- **Counterexample**: externalities across exporters

$$Y^*_{it}(\omega) = h_t\big(P^*_{it}(\omega), P^*_{it}\big) \overset{\text{e.g.}}{=} \left(\frac{P^*_{it}(\omega)}{P^*_{it}}\right)^{-\varepsilon} \left(\frac{P^*_{it}}{P^*_t}\right)^{-\rho} D^*_t$$

- Robust to *endogenous* firms' currency choice
  - exporters use foreign intermediates and do pricing-to-market
  - strong complementarities ⇒ exporters coordinate on DCP (Mukhin'2018)