Global Imbalances and Currency Wars at the ZLB

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Rethinking Capital Controls and Capital Flows
Global Imbalances

Figure: Current Account, % of World GDP
Global Interest Rates (Short and Long)

(a) policy rates

(b) 10-year nominal yields
Output Gap (Advanced Economies), percent
Goal

- Simple model to shed light on these developments:
  - transparent, parsimonious
  - closed-form solutions

- Capital flows, exchange rates, unemployment (and risk premia)

- Away from, or at Zero Lower Bound (ZLB)

- Policy
Main Ideas

- ZLB tipping point for Global Imbalances (benign to malign):
  - no ZLB → propagation of low interest rates via CA surpluses
  - ZLB → propagation of recessions via CA surpluses

- Regime of increased policy interdependence (± spillovers):
  - FX (zero sum)
  - inflation targets (positive sum)
  - government spending (positive sum)
  - public debt issuance (positive sum)
  - helicopter drops of money (positive sum)
  - some forms of QE (positive sum)
Two Countries

- Two countries: Home and Foreign

- Endowment $X$ of $H$ good grows at rate $g$

- Endowment $X^*$ of $F$ good grows at rate $g$

- Relative size (constant): $x = \frac{X}{X + X^*}$. 
Home Assets

- Dividends $\delta X$ capitalized by Lucas trees:
  - rate of depreciation $\rho$
  - rate of new trees creation $\rho$

- Public debt $D = dX$ financed by taxes $\tau$
Home Agents

- OLG “perpetual youth” with birth/death Poisson rate $\theta$
- Earn income at birth, save it, and consume at death
- Consumption shares on (H,F): $(x, 1-x)$
- Income of newborns: $(1 - \tau)(1 - \delta)X + \text{value of new trees}$
Financial Development/Securitization Capacity

- Interpret $\delta$ as financial development/securitization capacity, not capital share

- Only small part of capital income pledgeable to outside investors as “dividend” on tradable assets

- Depends on financial development/securitization capacity

- Interpret $\rho$ as technological churn and expropriation risk

- $V_t/PV_t$ depends on $\delta$ and $\rho$

\[
PV_t = \int_t^\infty X_s e^{-\int_t^s r_u du} ds
\]

\[
V_t = \delta \int_t^\infty X_t e^{-\int_t^s (r_u + \rho) du} ds
\]
Nominal Rigidities and Monetary Policy

- Competitive CES final good sector in each country
- Reinterpret endowment as non-traded input
  - transformed into variety of intermediate good sold monopolistically
  - H prices rigid in H currency, F prices rigid in F currency (PCP)
  - accommodate demand at posted price
- Capacity utilization $\xi \in [0, 1]$
- Truncated Taylor rule: $i = \max\{r^n - \psi(1 - \xi), 0\}$
- Real interest rate $r = i$
Foreign

Same as H but different parameters:

- Financial development/securitization capacity: $\delta^* \neq \delta$

- Public debt to GDP ratio $d^* \neq d$ and taxes $\tau^* \neq \tau$

- Other differences (extensions):
  - demographics and credit constraints (savers/borrowers)
  - securitization capacity & demand for safe assets
  - inflation targets
Equilibrium Equations (along BGP)

- **Asset pricing** ($V$: value of H trees in H currency)
  
  \[
  r^w V = -\rho V + \delta \xi X \\
  r^w V^* = -\rho V^* + \delta^* \xi^* X^*
  \]

- **Wealth accumulation** ($W$: H financial wealth in H currency):
  
  \[
  \dot{W} = g W = -\theta W + (1 - \delta)(1 - \tau) \xi X + r^w W + (\rho + g) V \\
  \dot{W}^* = g W^* = -\theta W^* + (1 - \delta^*)(1 - \tau^*) \xi^* X^* + r^w W^* + (\rho + g) V^*
  \]

- **Government budget constraints**:
  
  \[
  (r^w - g) D = \tau (1 - \delta) \xi X \\
  (r^w - g) D^* = \tau^* (1 - \delta^*) \xi^* X^*
  \]

- **Goods market clearing**: ($E$: nominal exchange rate)
  
  \[
  x\theta(W + EW^*) = \xi X \\
  (1 - x)\theta(W + EW^*) = E\xi^* X^*
  \]
ZLB “Complementary Slackness”

- No liquidity trap

\[ r^w > 0 \quad \text{and} \quad \xi = \xi^* = 1 \]

- Global liquidity trap

\[ r^w = 0 \quad \text{and} \quad \xi, \xi^* \leq 1 \]

- All or none world
No Liquidity Trap

- World interest rate as “average” of autarky interest rates

\[ r^w = r^{w,n} = -\rho + \frac{\ddot{\delta}\theta}{1 - \theta d} \]

with

\[ r^{a,n} = -\rho + \frac{\delta\theta}{1 - \theta d} \quad \text{and} \quad r^{a,n*} = -\rho + \frac{\delta^*\theta}{1 - \theta d^*} \]

- Net Foreign Assets and Current Account

\[ \frac{NFA}{X} = \frac{(1 - \theta d)(r^w - r^{a,n})}{(g + \theta - r^w)(\rho + r^w)} \quad \text{and} \quad \frac{CA}{X} = g \frac{NFA}{X} \]

- Exchange rate

\[ E = 1 \]
Figure 1a: Standard Metzler Diagram - Home

\[
\frac{W}{X} = \frac{1 - \delta - (r - g)d + (\rho + g) \frac{\delta}{r + \rho}}{g + \theta - r}
\]

\[
\frac{V + D}{X} = \frac{\delta}{r + \rho} + d
\]

\[
\frac{V + D}{X}, \quad \frac{W}{X}
\]

\[
\frac{NFA}{X} < 0
\]
The global equilibrium interest rate $r^w$ is such that world financial markets are in equilibrium: $\frac{NFA}{X} = x \frac{NFA}{X} + (1 - x) \frac{NFA^*}{X^*} = 0$. 

$$x \frac{NFA}{X} = x \frac{(1 - \theta d)(r - r^{a,n})}{(g + \theta - r)(r + \rho)}$$
Global Liquidity Trap

► World interest rate

\[ r^w = 0 \]

► Fixed-point equations for \( \xi \) and \( \xi^* \)

\[
\xi = \frac{\theta}{g + \theta} \left[ x \xi (1 + \frac{g \delta}{\rho}) + (1 - x) E \xi^* (1 + \frac{g \delta^*}{\rho}) + xgd + (1 - x)gd^* \right]
\]

\[
\xi^* = \frac{1}{E} \frac{\theta}{g + \theta} \left[ x \xi (1 + \frac{g \delta}{\rho}) + (1 - x) E \xi^* (1 + \frac{g \delta^*}{\rho}) + xgd + (1 - x)gd^* \right]
\]

► Multiple equilibria indexed by \( E \)...(Kareken-Wallace)

\[
E = \frac{\xi}{\xi^*}
\]
Global Liquidity Trap

Output gaps as “FX-weighted averages” of autarky output gaps

\[
\xi = x \frac{1 - \frac{\delta \theta}{\rho}}{1 - \frac{\delta \theta}{\rho}} \xi^{a,l} + (1 - x) \frac{1 - \frac{\delta^* \theta}{\rho}}{1 - \frac{\delta \theta}{\rho}} E \xi^{a,l*}
\]

\[
\xi^* = x \frac{1 - \frac{\delta \theta}{\rho}}{1 - \frac{\delta \theta}{\rho}} \frac{1}{E} \xi^{a,l} + (1 - x) \frac{1 - \frac{\delta^* \theta}{\rho}}{1 - \frac{\delta \theta}{\rho}} \xi^{a,l*}
\]

with

\[
\xi^{a,l} = 1 + \frac{1 - \theta d}{1 - \frac{\delta \theta}{\rho}} r^{a,n} \quad \text{and} \quad \xi^{a,l*} = 1 + \frac{1 - \theta d^*}{1 - \frac{\delta^* \theta}{\rho}} r^{a,n*}
\]

Net Foreign Assets and Current Account

\[
\frac{NFA}{X} = \frac{(1 - \frac{\delta \theta}{\rho})(\xi - \xi^{a,l})}{g + \theta} \quad \text{and} \quad \frac{CA}{X} = g \frac{NFA}{X}
\]
figure reports Home ($\xi$) and Foreign ($\xi^*$) output at the global ZLB, for different values of the exchange rate $E \in [\underline{E}, \bar{E}]$. \[ \xi = E \times \xi^* \]
Given $E$, Metzler diagram in quantities reports the size of the net foreign position as a function of the domestic liquidity trap $\xi$. Higher output (high $\xi$) increases wealth more than asset supply, so NFA increases.
Given $E$, $\xi$ is such that world financial markets are in equilibrium:

$$\frac{NFA}{X}(E) = x \frac{NFA}{X} + (1 - x)E \frac{NFA^*}{X^*} = 0.$$
Alternative Representation with “FX-weighted” Debt

- Output gaps

\[ \xi = \frac{\theta \bar{d}(E)}{1 - \frac{\delta \theta}{\rho}} \quad \text{and} \quad \xi^* = \frac{1}{E} \frac{\theta \bar{d}(E)}{1 - \frac{\delta \theta}{\rho}} \]

as function of “FX-weighted” average debt to GDP

\[ \bar{d}(E) = xd + (1 - x) Ed^* \]

- Net Foreign Assets and Current Account

\[ \frac{NFA}{X} = \frac{(1 - \frac{\delta \theta}{\rho})}{g + \theta} \left[ \frac{\theta \bar{d}(E)}{1 - \frac{\delta \theta}{\rho}} - \frac{\theta d}{1 - \frac{\delta \theta}{\rho}} \right] \]

\[ \frac{NFA}{X} = \frac{1 - \frac{\delta \theta}{\rho}}{1 - \frac{\bar{\delta} \theta}{\rho}} \frac{(1 - x)d^*(E - E^a)}{g + \theta} \]
Currency Wars and Reserve Currency Paradox

- $E$ determined by market coordination or FX intervention (peg)

- Beggar-thy-neighbor devaluations (zero-sum)

\[ E \uparrow \iff \xi \uparrow \xi^* \downarrow \frac{CA}{X} \uparrow \]

- Reserve currency paradox
Inflation

- ‘Old’ Keynesian Phillips curves (downward sticky prices)

\[
[\pi_{H,t} + \kappa_0 + \kappa_1(1 - \xi_t)](1 - \xi_t) = 0
\]
\[
[\pi_{F,t}^* + \kappa_0^* + \kappa_1^*(1 - \xi_t^*)](1 - \xi_t^*) = 0
\]

- Taylor rules with inflation targets $\bar{\pi} > 0$ and $\bar{\pi}^* > 0$

\[
i_t = \max\{0, r^n_t + \bar{\pi} + \phi(\pi_{H,t} - \bar{\pi})\}
\]
\[
i^*_t = \max\{0, r^{n*}_t + \bar{\pi}^* + \phi^*(\pi_{F,t}^* - \bar{\pi}^*)\}
\]
Inflation

- With $r^{w:n} < 0$, multiple equilibria with different TOT: $S = \frac{EP^*_F}{P_H}$

- **No liquidity traps** equilibrium ($i > 0$, $i^* > 0$) if inflation targets high enough: $r^{w:n} + \min\{\bar{\pi}, \bar{\pi}^*\} > 0$

- **Global liquidity trap** equilibrium ($i = i^* = 0$) with deflationary spiral
  - at world level, more wage flexibility $\rightarrow$ deeper recession
  - at country level, more wage flexibility $\rightarrow$ shallower recession

- **Asymmetric liquidity trap** equilibrium ($i = 0$, $i^* > 0$)
  - no recession in one country
  - worse recession in the other

- Inflation targets (positive sum) vs. FX interventions (zero sum)
Public Debt and Helicopter Drops of Money

- Public debt expansion (positive sum)...

\[ d \uparrow \implies \xi \uparrow \xi^* \uparrow \frac{CA}{X} \downarrow \]

- ...but not if used to finance asset purchases (different in model with safe and risky assets)

- Larger multiplier if higher private asset supply \( \bar{\delta} \)

- Equivalent to helicopter drops of money
Government Spending

- Government spending (positive sum)

\[ G \uparrow \iff \xi \uparrow \xi^* \uparrow \frac{CA}{X} \downarrow \]

- Domestic multiplier $> 1$ in SR
  (net asset supply boost + inflation boost through stimulus)

- More foreign leakage in LR
  (TOT appreciation)
More in Paper

- Home bias
- Non-unitary trade elasticities
- Borrowers and savers
  - aging
  - deleveraging
- Safe assets and global safe asset shortages (zoom in)
Real Returns on Capital (percent)

SOURCE: Authors’ calculations; for details, see Gomme, Ravikumar, and Rupert (2019).
U.S. Interest Rate and Equity Dividend Yield
U.S. Interest Rate and Equity Risk Premium

Note: Net Safe positions defined as the sum of Official Reserves (minus Gold), Portfolio Debt and Other Assets, minus Portfolio Debt and Other Liabilities. Source: Lane & Milesi-Ferretti (2007). Regions defined as in Figure 1.
Safe Assets and Global Safe Asset Shortages

- Endogenous risk premia
- Links reserve currency paradox and exorbitant privilege
- Can have ZLB in one country but not other (≠ real interest rates)

Policy:
- QE issue debt/purchase risky (not safe!) assets (positive sum)
- support private securitization capacity (positive sum)
- forward guidance (reduced effectiveness)
Safe Assets: Shocks and Preferences

- Disaster shock /w Poisson rate $\lambda \rightarrow 0$: output drops $\mu < 1$

- Set $d = d^* = 0$ and $\delta = \delta^*$

- Fraction $\alpha$ ‘Knightians’ (infinitely risk averse), $1 - \alpha$ Risk Neutral.

- Knightians have full home bias.

- Neutrals have ‘some’ home bias
Safe Assets: Securitization & Tranching

- Fraction $\phi < 1$ of H dividend **tranched** and recombined:
  - Poisson puts (pay nothing until Poisson shock)
  - Poisson calls (pay only until the Poisson shock)

- Knightians invest in **safe** assets combining puts and calls

- Neutrals invest in the rest

- **Constrained regime**: safe assets are scarce & Knightians price safe assets at the margin (safety premium).
Modified UIP and Risk Premia

- Fix exchange rate immediately after the shock \( E^+ \)

- No-arbitrage requires:

\[
\frac{r^w - r^K}{r^w - r^{K*}} = \frac{E}{E^+}
\]

- **Modified UIP equation**: the country with a high safety premium \((r^K < r^{K*})\) has a currency that will appreciate when the shock occurs \((E > E^+)\).

- **Reserve Currency Paradox**: if Home’s currency is expected to appreciate in bad times \((E > E^+)\), then \(r^K < r^{K*}\) and Home is more likely to experience a liquidity trap

- if \(\phi > \phi^*\) then \(NFA/X < 0\): exorbitant privilege.

- Metzler diagram in safe assets
Conclusion

This paper:

▶ model of global and local, permanent or persistent liquidity traps (secular stagnation)

▶ explores how traps in one country propagate to other countries

▶ in the benchmark model, trap is global or not at all
▶ the relative size of traps is controlled by the exchange rate. Powerful beggar-thy-neighbor effects

▶ ‘Metzler diagram in quantities’ links global imbalances to relative traps

▶ general result: reserve countries suffer a disproportionate share of the trap (the paradox of the reserve currency)

Ongoing work: quantitative