Global Imbalances and Currency Wars at the ZLB

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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

-8 -6 -4 -2 0 2 4 6
United States Eurozone Japan United Kingdom
Financial Crisis Eurozone Crisis
The figure reports $\ln(E/E_{2007m1})$ where $E$ denotes the foreign currency value of the dollar.
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 $\rightarrow$ propagation of low interest rates via CA surpluses
  ▶ ZLB $\rightarrow$ propagation of recessions via CA surpluses

▶ Regime of increased policy interdependence ($\pm$ 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)
Literature Review

Four strands of related literature:

▶ Asset shortages and global imbalances (Bernanke (2005), Caballero et al (2008), Mendoza et al (2009))


▶ Secular Stagnation (Summers 2014), Caballero & Farhi (2015), Eggertsson & Mehrotra (2014))

▶ Safety and public debt (Stein (2012), Gorton & Ordonez (2014), Caballero & Farhi (2015), Barro and Mollerus (2015))

Basic Model: Two Countries, no Risk

- 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 $\rho$

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

\[
V_t = \delta \int_t^\infty X_t e^{-\int_s^t (r_u + \rho) du} ds
\]
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** \((V: \text{value of H trees in H currency})\)
  \[
  r^w V = -\rho V + \delta \xi X \\
  r^w V^* = -\rho V^* + \delta^* \xi^* X^*
  \]

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

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

- **Goods market clearing:** \((E: \text{nominal exchange rate})\)
  \[
  x\theta(W + EW^*) = \xi X \\
  (1 - x)\theta(W + EW^*) = E\xi^* X^*
  \]
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

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

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

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

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

and

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

- Net Foreign Assets and Current Account

\[
\frac{NFA}{X} = \frac{(1 - \frac{\delta \theta}{\rho})(\xi - \xi^{a,l})}{g + \theta}
\]

and

\[
\frac{CA}{X} = g \frac{NFA}{X}
\]
figure reports Home ($\xi$) and Foreign ($\xi^*$) output at the global ZLB, for different values of the exchange rate $E \in [\underline{E}, \bar{E}]$. 

\[ \xi = E \times \xi^* \]
Metzler Diagram in Quantities - Global

Given $E$, $\xi$ is such that world financial markets are in equilibrium:

$$\frac{NFA}{X}(E) = x \frac{NFA}{X} + (1-x)E \frac{NFA^*}{X^*} = 0.$$
Currency Wars and Reserve Currency Paradox

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

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

  $E \uparrow \implies \xi \uparrow \xi^* \downarrow \frac{CA}{X} \uparrow$

- 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 $\bar{\pi}^* > 0$

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

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

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

- **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)
  \[ G \uparrow \implies \xi \uparrow \xi^* \uparrow \frac{CA}{X} \downarrow \]

- 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 (2011).
U.S. Interest Rate and Equity Risk Premium

Safe Asset Imbalances

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, increases at the ZLB

- 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 $\lambda \to 0$: 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 **tranchled** 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)
- Traps in one country propagate to other countries
- Powerful beggar-thy-neighbor effects vis-à-vis FX
- Model accounts for decline in risk-free rate and increase in risk premia
- Paradox of the reserve currency: reserve countries suffer a disproportionate share of the trap