Global Imbalances and Currency Wars at the ZLB

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Rethinking Capital Controls and Capital Flows

Global Imbalances

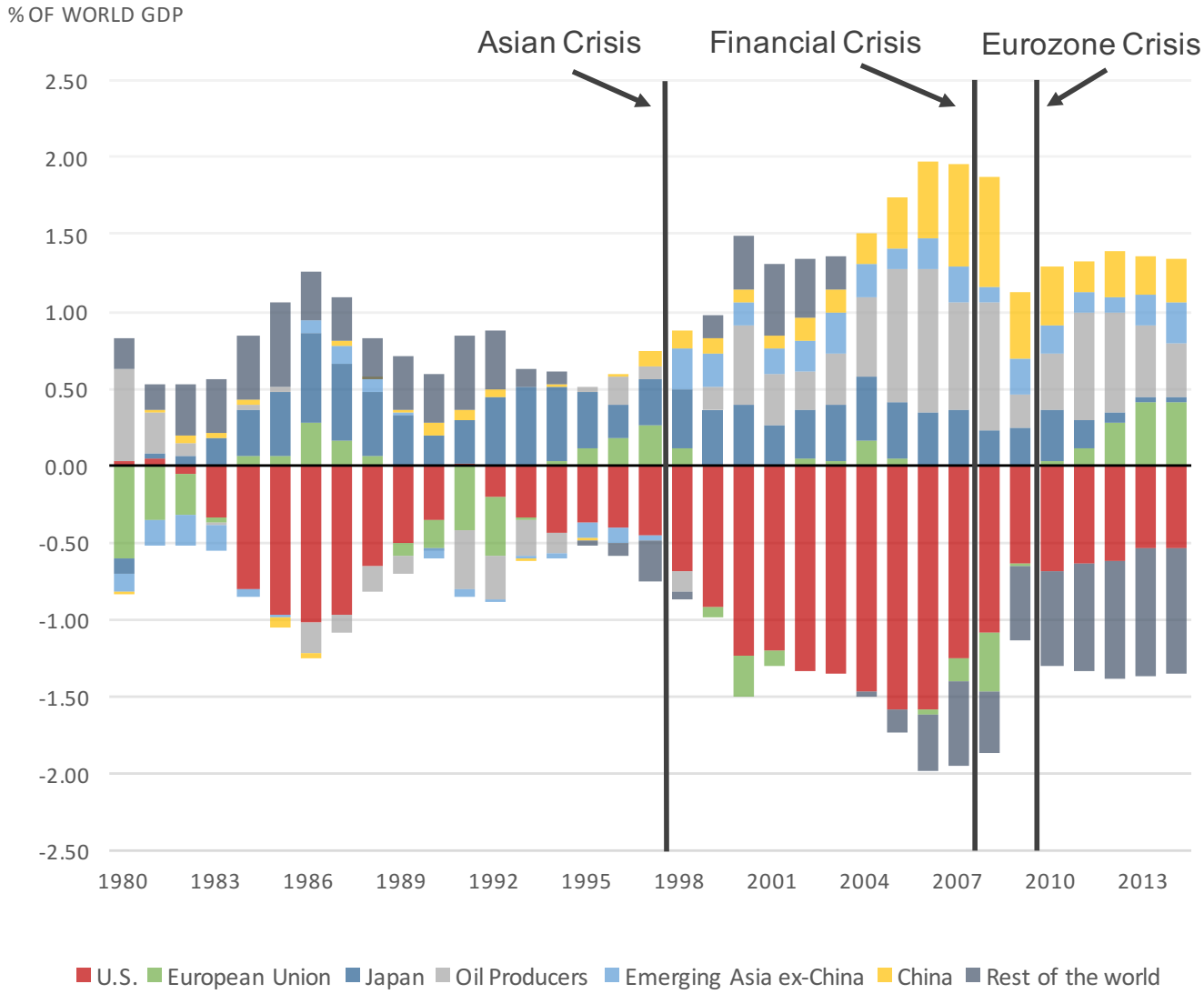
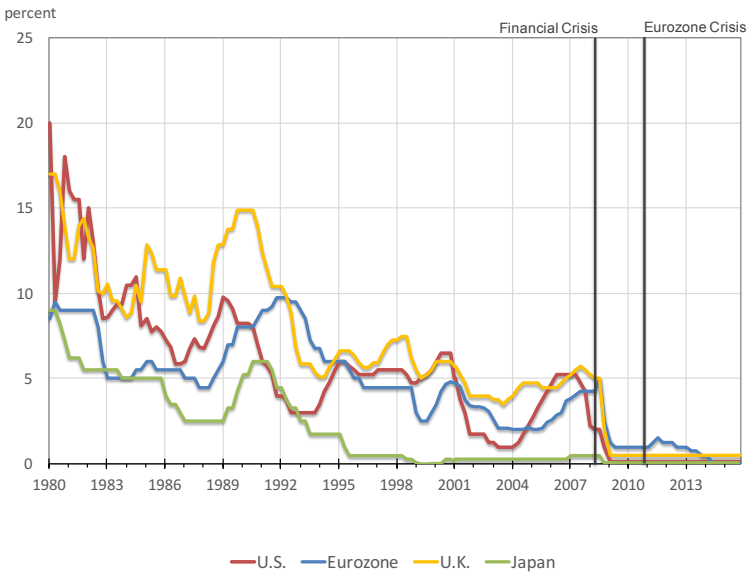
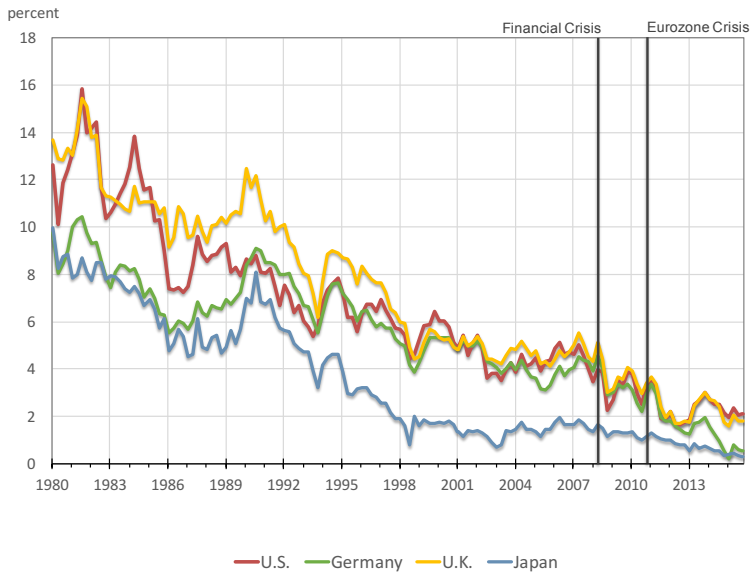


Figure: Current Account, % of World GDP

Global Interest Rates (Short and Long)

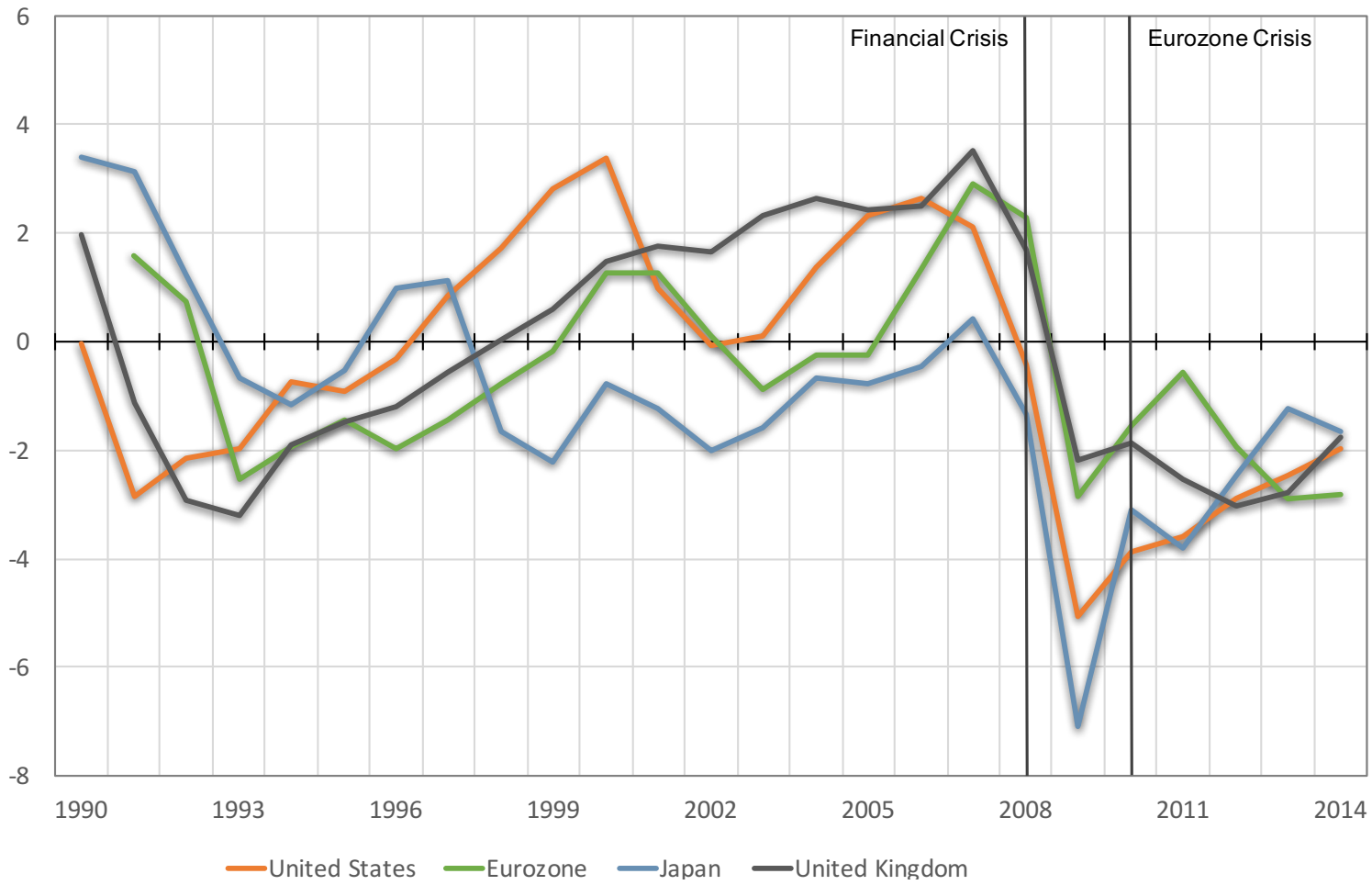


(a) policy rates



(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 $\rightarrow$ 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)

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 δX capitalized by Lucas trees:
  - rate of depreciation ρ
  - rate of new trees creation ρ
- Public debt $D = dX$ financed by taxes τ

Home Agents

- OLG "perpetual youth" with birth/death Poisson rate θ;
- Earn income at birth, save it, and consume at death;
- Consumption shares on (H,F): $(x, 1-x)$;
- Income of newborns: $(1-\tau)(1-\delta)X+$ value of new trees

Financial Development/Securitization Capacity

- Interpret δ 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 ρ as technological churn and expropriation risk
- V_t/PV_t depends on δ and ρ

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

$$V_t = \delta \int_t^\infty X_t e^{-\int_t^s (r_u+\rho) du} ds$$

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)

$$\begin{aligned} r^w V &= -\rho V + \delta \xi X \\ r^w V^* &= -\rho V^* + \delta^* \xi^* X^* \end{aligned}$$

- **Wealth accumulation** (W: H financial wealth in H currency):

$$\begin{aligned} \dot{W} &= gW = -\theta W + (1-\delta)(1-\tau)\xi X + r^w W + (\rho + g)V \\ \dot{W}^* &= gW^* = -\theta W^* + (1-\delta^*)(1-\tau^*)\xi^* X^* + r^w W^* + (\rho + g)V^* \end{aligned}$$

- **Government budget constraints**:

$$\begin{aligned} (r^w - g)D &= \tau(1-\delta)\xi X \\ (r^w - g)D^* &= \tau^*(1-\delta^*)\xi^* X^* \end{aligned}$$

- **Goods market clearing**: (E: nominal exchange rate)

$$\begin{aligned} x\theta(W + EW^*) &= \xi X \\ (1-x)\theta(W + EW^*) &= E\xi^* X^* \end{aligned}$$

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

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

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

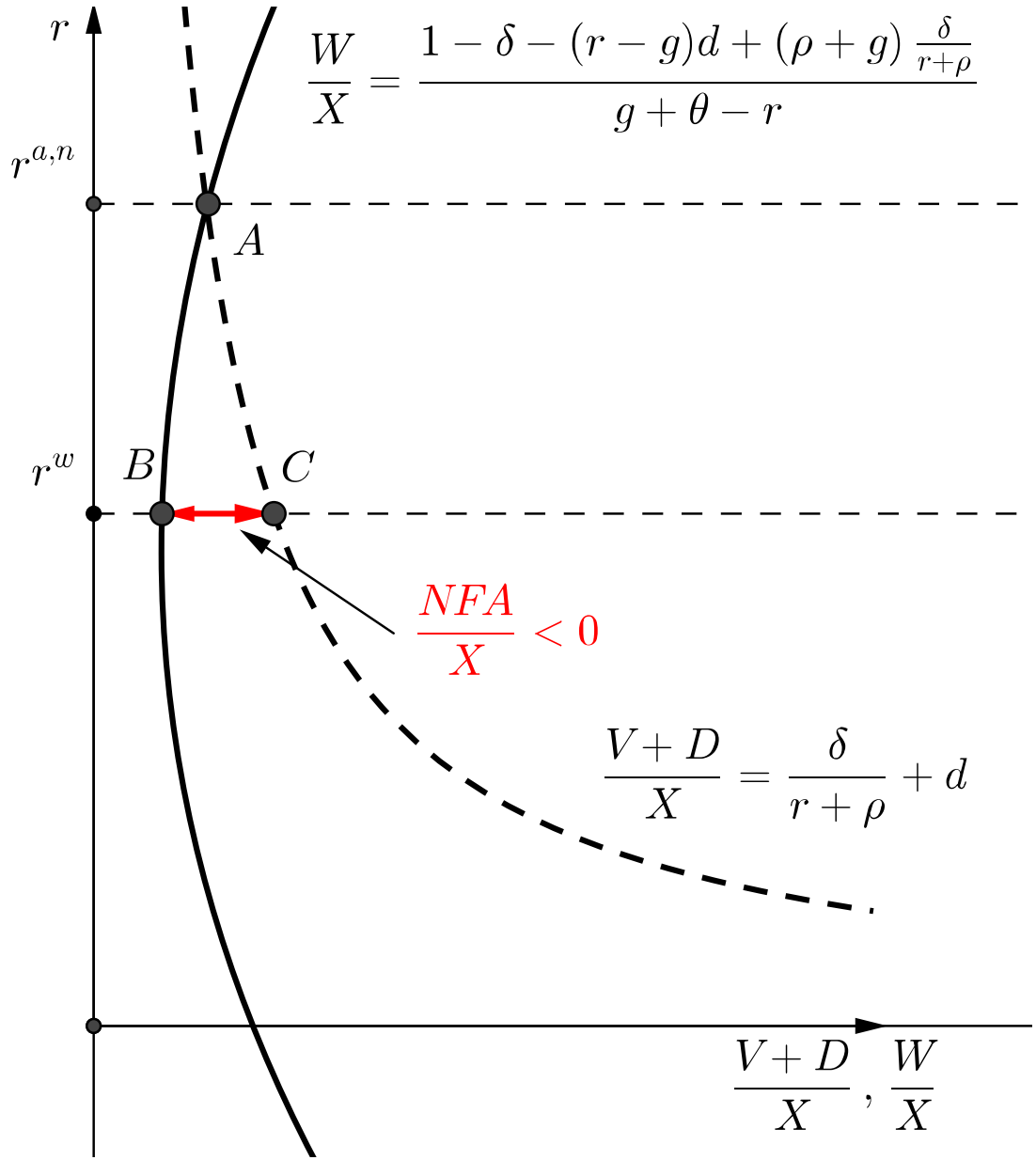
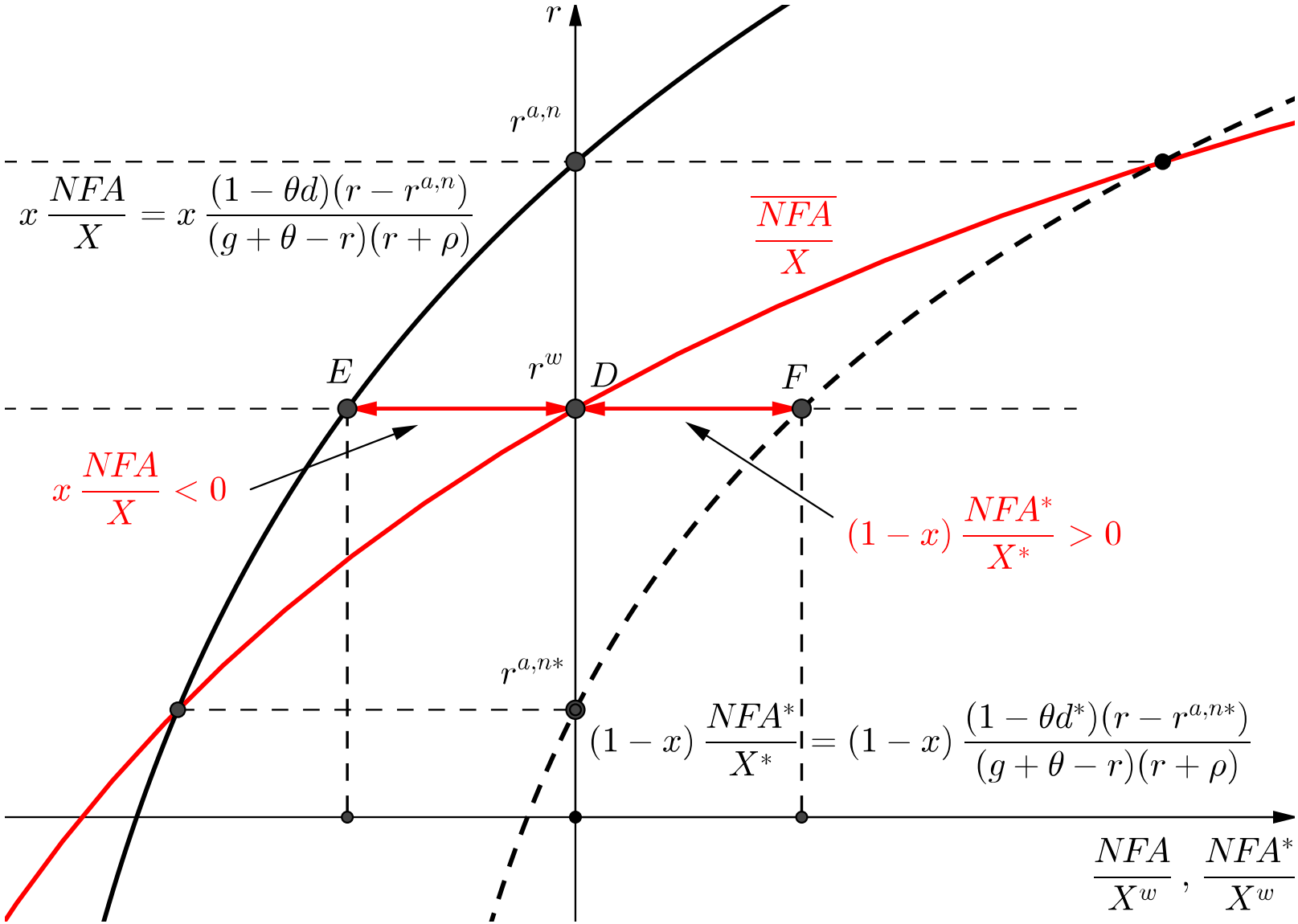


Figure 1b: Standard Metzler Diagram - Global



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

Global Liquidity Trap

- World interest rate

$$r^w = 0$$

- Fixed-point equations for ξ and ξ^*

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

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

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

$$E = \frac{\xi}{\xi^*}$$

Global Liquidity Trap

- Output gaps as "FX-weighted averages" of autarky output gaps

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

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

with

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

- Net Foreign Assets and Current Account

$$\frac{NFA}{X} = \frac{(1-\frac{\delta\theta}{\rho})(\xi - \xi^{a,l})}{g+\theta} \quad \text{and} \quad \frac{CA}{X} = g\frac{NFA}{X}$$

Output Determination in the Global ZLB

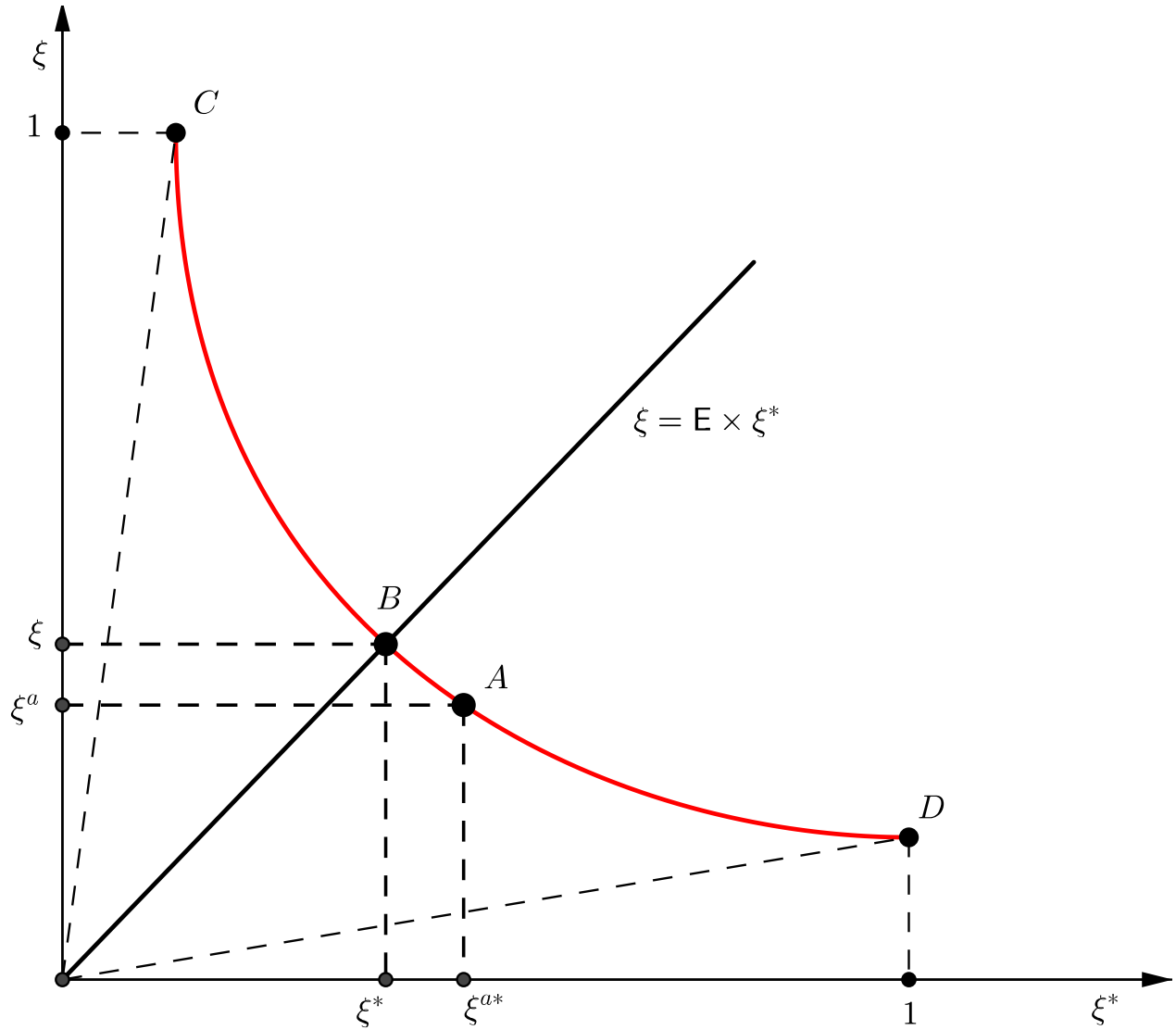
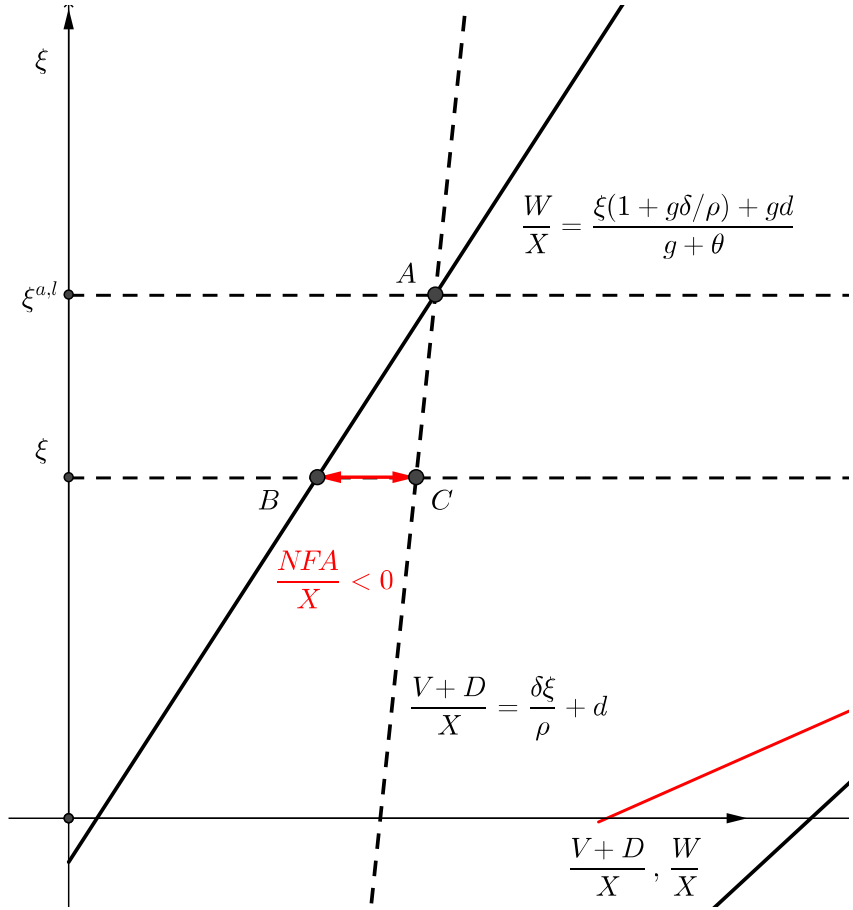


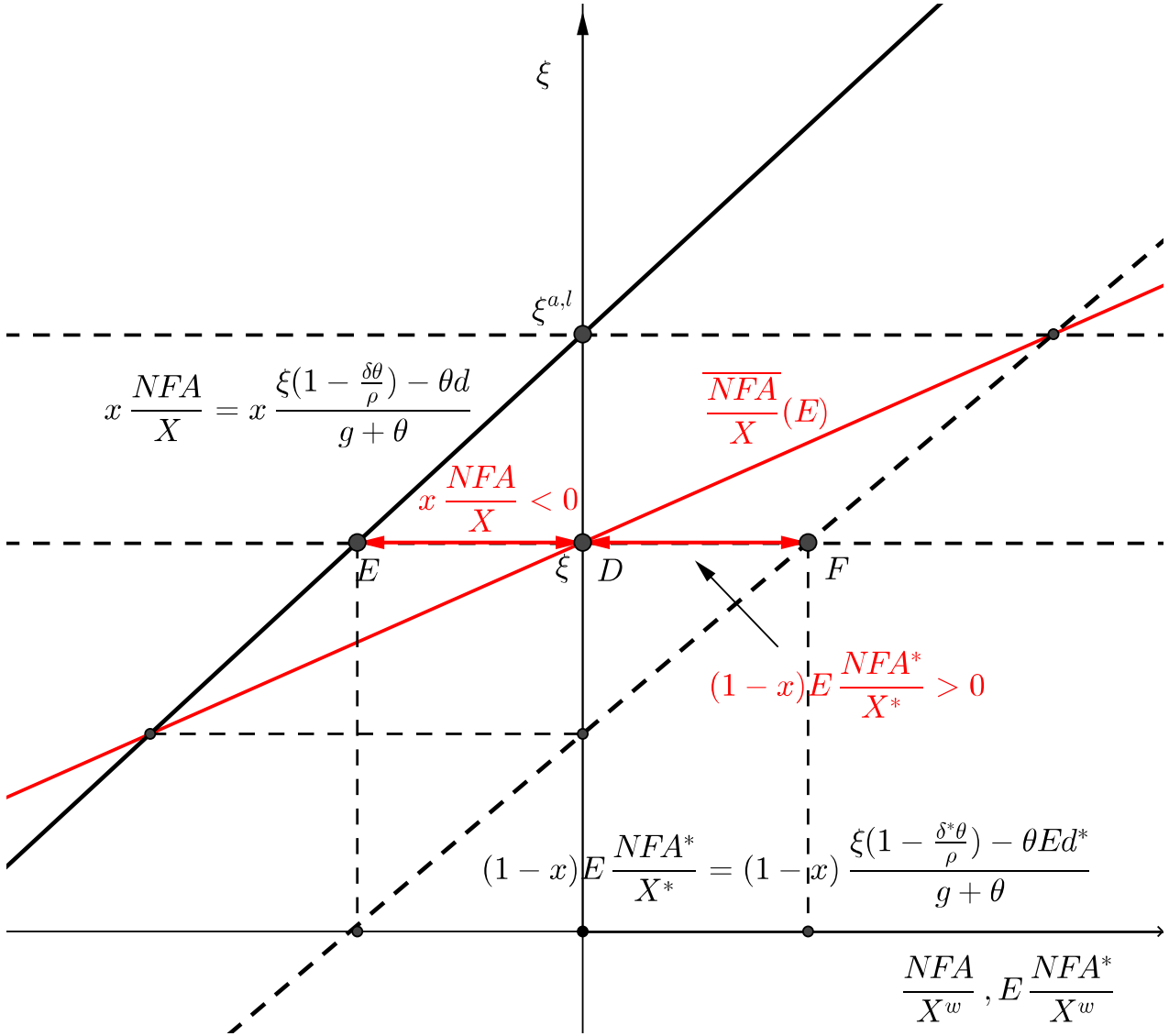
figure reports Home (ξ) and Foreign (ξ^*) output at the global ZLB, for different values of the exchange rate $E \in [\underline{\mathsf{E}}, \bar{E}]$.

Figure 2a: Metzler Diagram in Quantities - Home



Given E, Metzler diagram in quantities reports the size of the net foreign position as a function of the domestic liquidity trap ξ. Higher output (high ξ) increases wealth more than asset supply, so NFA increases.

Figure 2b: Metzler Diagram in Quantities - Global



Given E, ξ is such that world financial markets are in equilibrium:

$$\overline{\frac{NFA}{X}}(E) = x\frac{NFA}{X} + (1-x)E\frac{NFA^*}{X^*} = 0.$$

Alternative Representation with "FX-weighted" Debt

- Output gaps

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

as function of "FX-weighted" average debt to GDP

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

- Net Foreign Assets and Current Account

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

$$\frac{NFA}{X} = \frac{1 - \frac{\delta\theta}{\rho}}{1 - \frac{\bar{\delta}\theta}{\rho}} \frac{(1 - x)d^*(E - E^a)}{g + \theta}$$

Currency Wars and Reserve Currency Paradox

- E determined by market coordination or FX intervention (peg)
- Beggar-thy-neighbor devaluations (zero-sum)

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

- 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)...

$$d \uparrow \Longrightarrow \xi \uparrow \xi^* \uparrow \frac{CA}{X} \downarrow$$

- ...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)

$$G \uparrow \Longrightarrow \xi \uparrow \xi^* \uparrow \frac{CA}{X} \downarrow$$

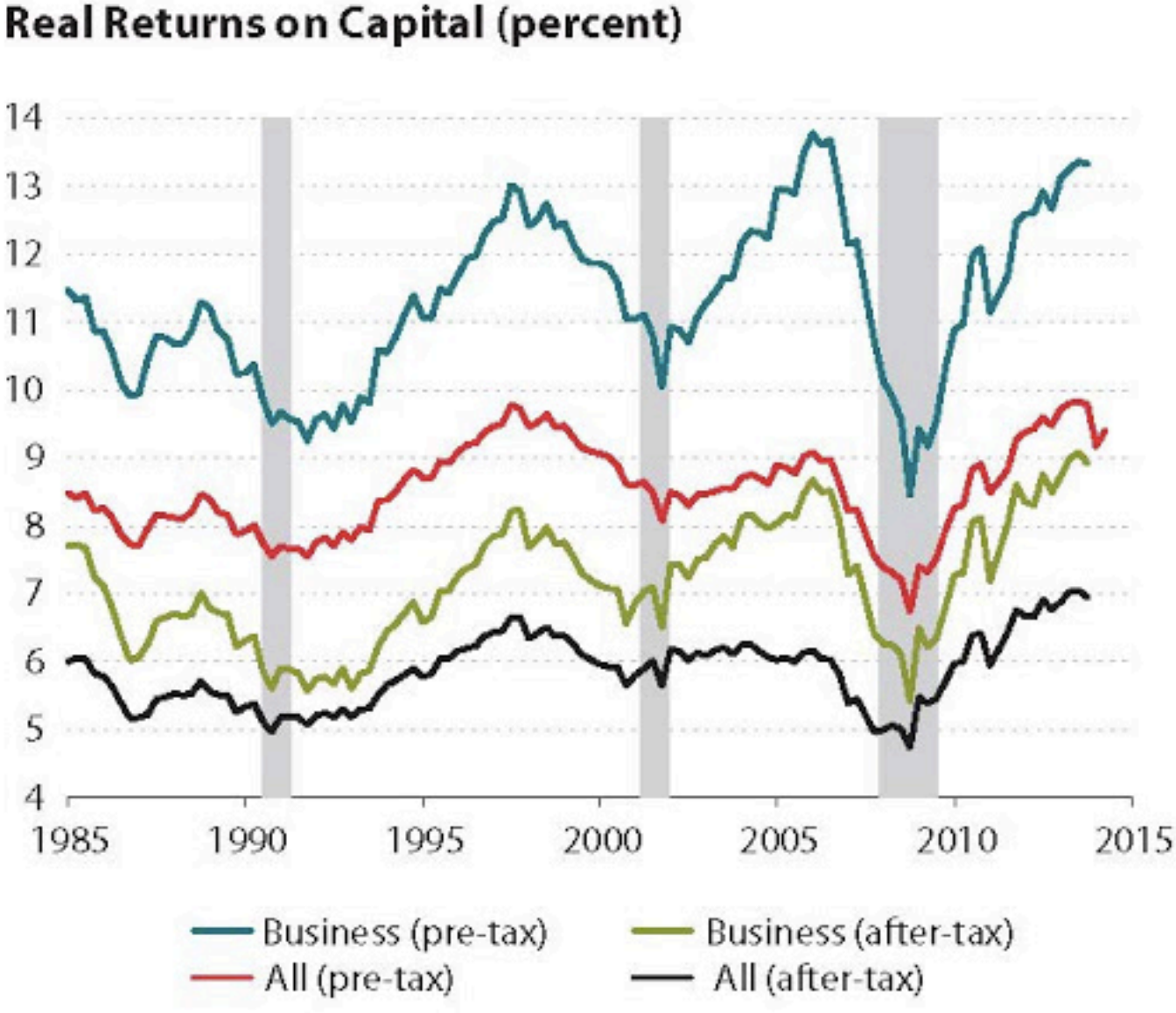
- Domestic multiplier > 1 in SR
  (net asset supply boost + inflation boost through stimulus)

- More foreign leakage in LR
  (TOT appreciation)

More in Paper

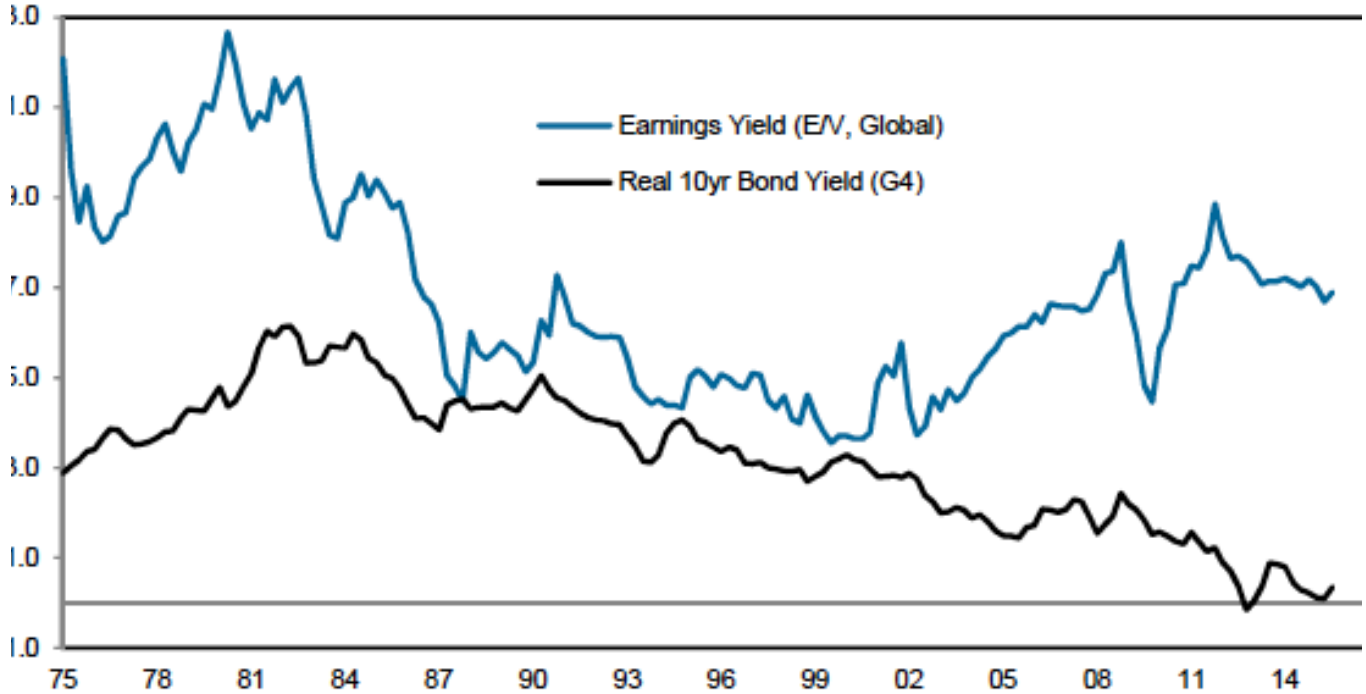
- Home bias
- Non-unitary trade elasticities
- Borrowers and savers
  - aging
  - deleveraging
- Safe assets and global safe asset shortages (zoom in)

U.S. MPK

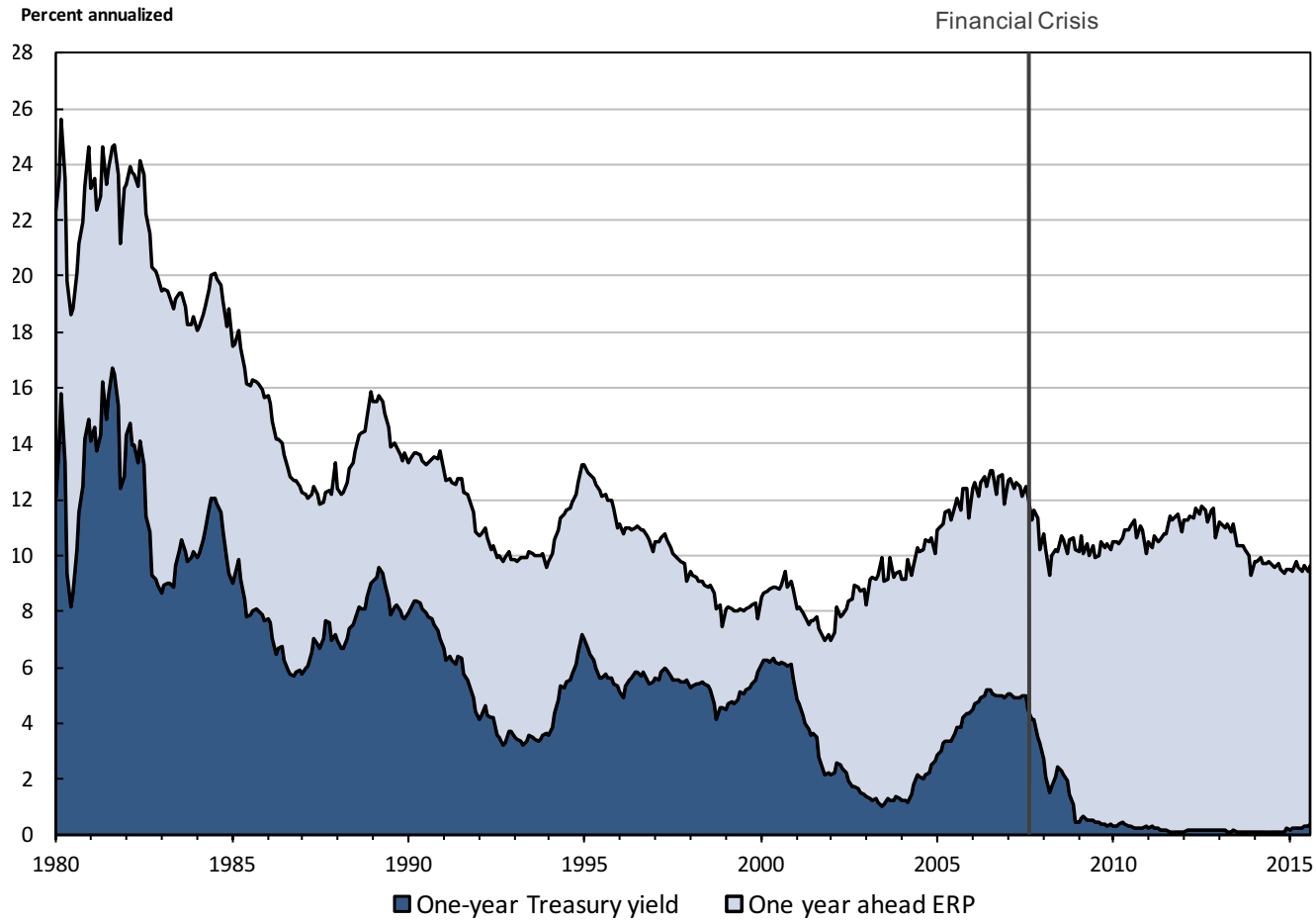


SOURCE: Authors' calculations; for details, see Gomme, Ravikumar, and Rupert

U.S. Interest Rate and Equity Dividend Yield

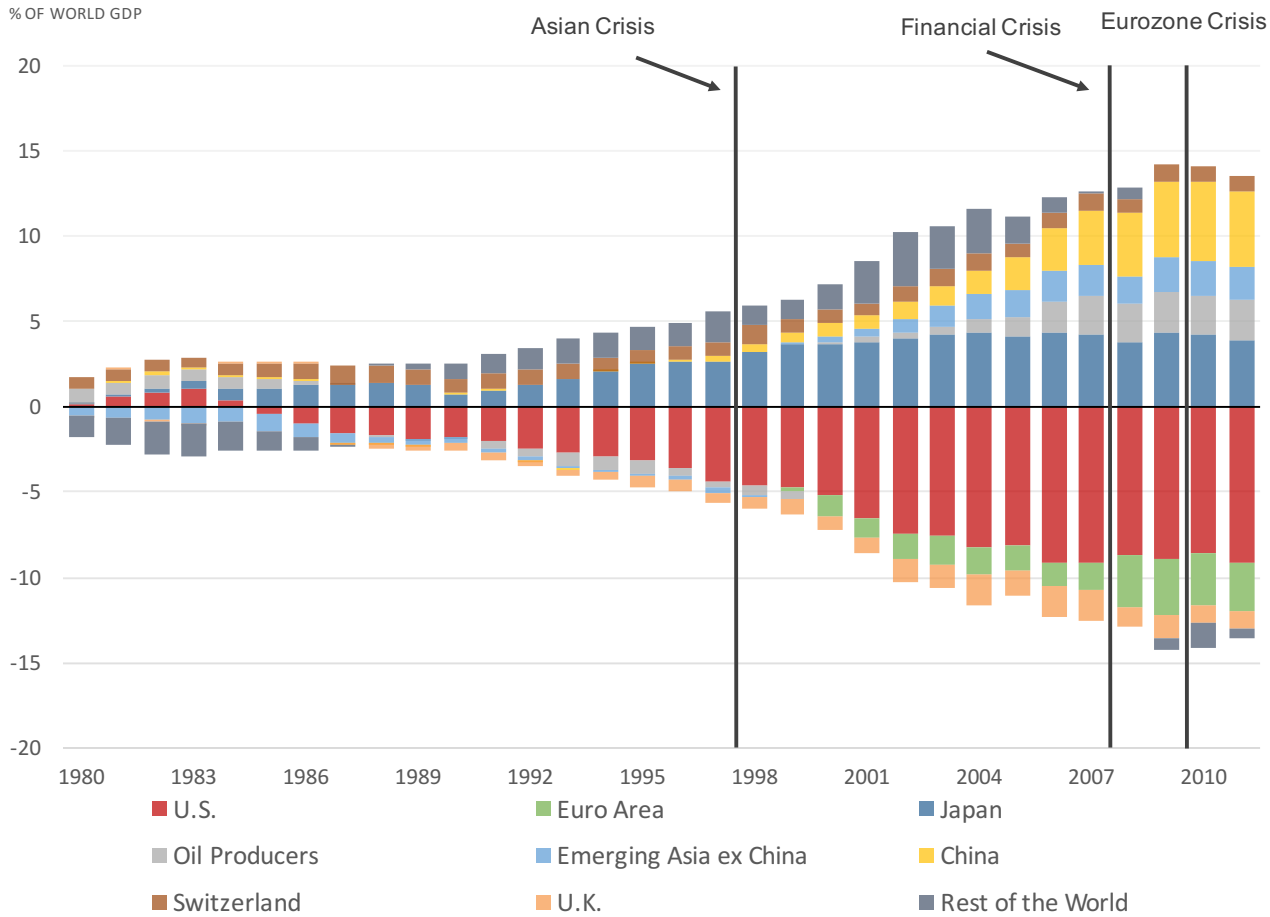


U.S. Interest Rate and Equity Risk Premium



Source: one-year Treasury yield: Federal Reserve H.15; ERP: Duarte & Rosa (2015).

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
- Links reserve currency paradox and exorbitant privilege
- Can have ZLB in one country but not other ($\neq$ 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 α '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: quantiative