International Monetary System and Safe Assets

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Keynes Lecture
University of Cambridge 2024-05-10
Motivation

- Is the International Monetary System/Global Financial Architecture inherently distortionary?
  - Do the rich insure the poor or the other way around?
  - If so, why? How?
  - Who can run stimulus programs? Who is forced to run austerity programs?

- What role do Safe Assets play?
  - Who enjoys Exorbitant Privilege to Issue Safe Asset?
  - Can government spend without taxation? How much?
  - What are Safe Assets and its service flow?
  - Flight-to-safety phenomenon (negative $\beta$)
  - Is there a complementarity btw safe asset and bubbly asset?
What’s is a Safe Asset Service Flow?

- Safe asset = good friend
- Idiosyncratic risk: provides partial insurance through re-trading

Based on BruMerSan 2024 “Safe Assets”
What’s is a Safe Asset Service Flow?

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Based on BruMerSan 2024
“Safe Assets”
What’s a Safe Asset? Exorbitant Privilege rises in Recessions

- Safe asset = good friend
  - Idiosyncratic risk: provides partial insurance through re-trading
  - Aggregate risk: appreciates in value in bad times (negative $\beta$)

In recessions:
- Risk is higher
- Service flow is more valuable
- Cash flows are lower
  (depends on fiscal policy)
What’s a Safe Asset?

- **Good friend** (relative to own net worth return $d_{t}^{n_{t}}$)
  - Idiosyncratic risk
  - Aggregate risk $\beta \leq 0$ – appreciates in times of high risk

$$\text{Cov}_{t}[SDF_{t}^{j}, dr_{t}^{safe} - dr_{t}^{n_{t}}] \geq 0$$

- Provides **service flow** (+ cash flow) in incomplete market settings

$$\frac{B_{t}}{\mathcal{O}_{t}} = E_{t}[PV_{\xi^{**}}(\text{primary surpluses})] + E_{t}[PV_{\xi^{**}}(\text{service flows})]$$

$\Rightarrow$ Lower cash flow interest rate on gov debt $r$ [Gov. Debt Valuation Puzzle]

- **Low trading costs** are important for service flow
  - Limited asymmetric information, info sensitivity, trading cost
Complementarity btw Safe Asset & Bubble

⇒ A bubbly asset is more likely a safe asset
  ▪ Bubble can expand in downturns (even when cash flow declines)
    ⇒ easier to satisfy: \( \text{Cov}_t [SDF_t^j, \delta r_t^{safe} - \delta r_t^{ni}] \geq 0, \quad \beta^{CAPM} \leq 0 \)

⇐ A safe asset is more likely a bubble
  ▪ Safe asset with \( \beta^{CAPM} \leq 0 \),
    has lower expected cash flow return as risk premium is negative
    ⇒ easier to satisfy bubble condition: \( r_t^{f} + \underbrace{\text{risk premium}}_{\leq 0} \leq g_t \) (on average)
      ▪ Also, \( r_t^{f} \) is depressed by precautionary savings (incl. uninsurable idiosyncratic risk)

▪ Bubble:
  ▪ Issue *long-term asset*, whose value exceeds fundamental value (of e.g. zero)

▪ Ponzi scheme:
  ▪ Rollover existing *short-term debt* with growing new (short-term) debt
    ▪ Which needs to be rolled over again.
2 Country Setting

- Country $N$’s exorbitant privilege > $\frac{1}{2}$ > Country $S$’s

- Steady state: $N$-gov. issues safe asset bonds (at low $r$) to $S$-citizens

- Global (idiosyncratic) risk ↑ shock: (⇒ macro + investment implications)
  ⇒ Fiscal Space of $N$ ↑ of $S$ ↓ due to flight to safety
  tax$^N$ ↓ tax$^S$ ↑
  capital flow
Safe Asset (Shortage vs. Asymmetric Supply):
- Global shortage: Caballero et al. (2016,17), ...
- Asymmetric Supply: BruMerSan (2024 “Safe Assets”), ESBies, GloSBies, ...
- Info sensitivity: Gorton Pennachi (1990), Dang et al. (2017),

Public Debt Evaluation Puzzles/FTPL:
- Jiang et al. (2020,2021), BruMerSan (2020 “FTPL”) Bubble

Bubble and Macrofinance
- Large $r$ vs. $g$ literature...

US as (Levered) Financial Center, GFC
- Kindleberger (1965), Gourinchas Rey (World Venture Capitalist) (2005),
- Miranda-Agrippino and Rey (2022), Oskolkov (2024), ...

Reserve Paradox
- Maggiori (2017), Jiang Krishnamurthy Lustig (2023), Devereux Engel Wu (2023)
Roadmap

- Motivation, Safe Asset: Intuition and Definition
- Two Country Model Setup
  - Symmetric Benchmark
- World Government (Bond) ⇒ “Safe Asset Pricing”
- Two countries with Constant Idiosyncratic Risk and ⇒ Asymmetric Permanent Exorbitant Privilege
- Risk Shock and its Transition ⇒ Insurance of $S$ by $N$ in the long-run
- Time-varying Idiosyncratic Risk $\tilde{\sigma}_t \in \{\tilde{\sigma}^L, \tilde{\sigma}^H\}$ ⇒ Flight-to-Safety Exorbitant Privilege and $\beta^N < \beta^S$ ⇒ EMDE Costly Stimulus Policy
- Future: “Battle for the Bubble” + Exchange Rate Policy with Sticky Prices

Ceteris Paribus Analysis
- Total symmetry, except in one dimension: share of safe asset “exorbitant privilege bubble”
Two Country Model: Overview

- Continuous time, infinite horizon, two consumption goods: (nuts and spices)
- 2 large countries: $N$ and $S$ (“north” and “south”)
  - Both countries are symmetric
  - Each country issues government bonds
- Continuum of citizens in each country
  - Operate capital with time-varying idiosyncratic risk, $AK$ production technology
  - Can trade capital, government bonds of both countries
  - No citizen mobility
- Two Governments
  - Exogenous spending
  - Issues (nominal) bonds
  - Taxes output to close budget
- Financial Frictions: incomplete markets
  - Agents cannot insure idiosyncratic risk (must retain skin in the game)
  - Aggregate risk: fluctuations in volatility of idiosyncratic risk (& capital productivity)
Two Country Model

- Citizens in (north) country $N, \tilde{t} \in [0, \frac{1}{2}]$ and in (south) country $S, \tilde{t} \in [\frac{1}{2}, 1]$

- Country $N$ produces nuts, $n$  Country $S$ produces spices, $s$
  - With the same physical capital, $ak^\tilde{t} dt$, (constant return to scale)

- CES utility function, **elasticity of substitution** btw nuts and spices, $\varepsilon$

\[
c_t = \left( (c^n_t)^{\frac{\varepsilon-1}{\varepsilon}} + (c^s_t)^{\frac{\varepsilon-1}{\varepsilon}} \right)^{\frac{\varepsilon}{\varepsilon-1}}
\]

- Aggregate consumption good $c_t$ for country $I$

\[
E \left[ \int_0^\infty e^{-\rho t} \left( \log c_t^{l,\tilde{t}} + \log(\varrho \frac{1}{2} K_t) \right) dt \right]
\]
Two Country Model

- Citizens $\tilde{i}$ in $N$, (country $S$ symmetric)

$$E \left[ \int_0^\infty e^{-\rho t} \left( \log c_{t}^{\tilde{i}} + \log(\mathcal{G} \frac{1}{2} K_t) \right) dt \right]$$

s.t. No Ponzi &

$$\frac{dn_{t}^{\tilde{i}}}{n_{t}^{\tilde{i}}} = -\frac{c_{t}^{\tilde{i}}}{n_{t}^{\tilde{i}}} dt + \theta_t^{B^N,i} dr_{t}^{B^N} + \theta_t^{B^S,i} dr_{t}^{B^S} + \left( 1 - \theta_t^{B^N,i} - \theta_t^{B^S,i} \right) dr_t^{K,i}$$

- Each citizen operates physical capital $k_t^{\tilde{i}}$ in his country
  - Output in nuts: $a k_t^{\tilde{i}} dt$
    - Sold in at global market at nut price $p^n$ in country $N$ numeraire $c^N$.

$$\frac{dk_{t}^{\tilde{i}}}{k_{t}^{\tilde{i}}} = \mu^K dt + \ddot{o}_t d\tilde{Z}_t + d\Delta_{t}^{k,i}$$

$\kappa = \text{capital share of } N$

- $d\tilde{Z}_t$ idiosyncratic Brownian
- $\ddot{o}_t \in \{\ddot{o}^L, \ddot{o}^H\}$ exogenous process with Poisson arrival rate

- Frictions:
  - Incomplete markets: no $d\tilde{Z}_t$-claims (risky equity claims)
  - Output goods, capital and government bonds can be traded across borders
Government: Taxes, Bond/Money Supply, Gov. Budget

- **Policy Instruments**
  - $g \cdot \frac{1}{2} K_t$ – Government spending (with exogenous $g$) identical in both countries
  - $\tau_t p_t^n a K_t^N$ – Proportional output tax at rate $\tau_t$, $p_t^n$ is price of nuts in terms of world output good
  - $\frac{dB_t^N}{B_t^N} = \mu_t^B dt$ – Nominal government debt issuance
  - $i_t^N$ – Floating nominal interest rate on outstanding bonds

- **Government budget constraint (BC)**

\[
\left( \mu_t^B - i_t^N \right) B_t^N + \phi_t^N \left( \tau_t p_t^n a K_t^N - \frac{1}{2} g_t \right) K_t = 0
\]

- $N$’s **primary surplus** of (per world $K_t$)

- **Equilibrium selection:** No No-Ponzi constraint

Not market clearing, payment/redistribution to bond holders clears bond market

World capital stock
Motivation, Safe Asset: Intuition and Definition

Two Country Model Setup
- Symmetric Benchmark

World Government (Bond) ⇒ “Safe Asset Pricing”

Constant Idiosyncratic Risk and ⇒ Asymmetric Permanent Exorbitant Privilege

Risk Shock and its Transition ⇒ Insurance of $S$ by $N$ in the long-run

Time-varying Idiosyncratic Risk $\sigma_t \in \{\sigma^L, \sigma^H\}$ ⇒ Flight-to-Safety Exorbitant Privilege and $\beta^N < \beta^S$ ⇒ EMDE Costly Stimulus Policy

Future: “Battle for the Bubble” + Exchange Rate Policy with Sticky Prices
World Government (Bond)

- Merge both countries
  - 1 government + 1 bond

- \( \kappa = \eta = 1/2 \) and \( \# \) of nuts = \( \# \) of spices

- Bond pricing as in “Safe Asset” BruMerSan-paper
Debt Valuation (FTPL) – Two Perspectives

- **Buy and Hold Perspective:**
  - \[ \frac{B_0^I}{\phi_0^I} = \lim_{T \to \infty} \left( \mathbb{E} \left[ \int_0^T \xi_t s_t^l K_t dt \right] + \mathbb{E} \left[ \frac{\xi_t B_T^I}{\phi_T^I} \right] \right) \]
  - Valuation of strategy that buys and holds a fixed fraction of outstanding debt

- **Agent \( i \)'s SDF, \( \xi_t^i / \xi_t^i \):**
  - \[ d \frac{\xi_t^i}{\xi_t^i} = -r_t^f dt - \varsigma_t dZ_t - \tilde{\varsigma}_t^i d\tilde{Z}_t^i, \] idiosyncratic consumption vol. \( \tilde{\sigma}_t^c \)
Debt Valuation (FTPL) – Two Perspectives

- **Buy and Hold Perspective:**
  \[ \frac{B_0^I}{\varphi_0^I} = \lim_{T \to \infty} \left( \mathbb{E} \left[ \int_0^T \xi_t^i s_t^i K_t \, dt \right] + \mathbb{E} \left[ \xi_t^i \frac{B_T^I}{\varphi_T^I} \right] \right) \]
  - Valuation of strategy that buys and holds a fixed fraction of outstanding debt

- **Dynamic Trading Perspective:**
  \[ \eta_0^i \frac{B_0^I}{\varphi_0^I} = \mathbb{E} \left[ \int_0^\infty \xi_t^i \eta_t^i \ s_t^i K_t \, dt \right] + \mathbb{E} \left[ \int_0^\infty \xi_t^i \eta_t^i \ (\tilde{\sigma}_t^c)^2 \frac{B_t^I}{\varphi_t^I} \, dt \right] \]
  - Valuation of equilibrium cash flows from individual bond portfolios, incl. trading cash flows (aggregated over all agents \(i\) to obtain total value of debt)

- Agent \(i\)'s SDF, \(\xi_t^i\):
  \[ d\xi_t^i / \xi_t^i = -r_t^f \, dt - \zeta_t dJ_t - \tilde{\zeta}_t^i d\tilde{Z}_t^i, \] idiosyncratic consumption vol. \(\tilde{\sigma}_t^c\)
Debt Valuation (FTPL) – Two Perspectives

- **Buy and Hold Perspective:**
  - $\frac{B_0^l}{\varphi_0^l} = \lim_{T \to \infty} \left( \mathbb{E} \left[ \int_0^T \xi_t^i s_t^l K_t dt \right] + \mathbb{E} \left[ \xi^i \frac{B_T^l}{\varphi_T^l} \right] \right)$
  - Valuation of strategy that buys and holds a fixed fraction of outstanding debt

- **Dynamic Trading Perspective:**
  - $\frac{B_0^l}{\varphi_0^l} = \mathbb{E} \left[ \int_0^\infty \left( \int_0^1 \xi_t^i \tilde{\eta}_t^i di \right) s_t^l K_t dt \right] + \mathbb{E} \left[ \int_0^\infty \left( \int \xi_t^i \eta_t^i di \right) \left( \tilde{\sigma}_t^c \right)^2 \frac{B_t^l}{\varphi_t^l} dt \right]$
  - Valuation of equilibrium cash flows from individual bond portfolios, incl. trading cash flows (aggregated over all agents $i$ to obtain total value of debt)

- Agent $i$’s SDF, $\xi_t^i$: $d \xi_t^i / \xi_t^i = -r_t^f dt - \zeta_t dJ_t - \tilde{\zeta}_t^i d\tilde{Z}_t^i$, idiosyncratic consumption vol. $\tilde{\sigma}_t^c$
Safe Asset – Service flow >> Cash flow

- Asset Price = \( E[\text{PV(cash flows, primary surplus } sK_t)] \) + \( E[\text{PV(service flows)}] \)
What is Quasi-SDF $\xi_t^{**} = \int \xi_t^i \eta_t^i di$?

- **Buy and Hold Perspective:**
  Expected bond return (for log utility)
  $$= \rho + \gamma \mathbb{E}[g_c] - \frac{1}{2} \gamma (\gamma + 1) \{ \text{Var}_t[g_c] + \text{Var}_t[\tilde{g}_c] \} + \text{risk premium} - \text{convience yield}$$
  Risk-free rate $r^f = $
  Discount rate

- **Dynamic Trading Perspective:**
  Expected bond return
  $$= \rho + \gamma \mathbb{E}[g_c] - \frac{1}{2} \gamma (\gamma + 1) \{ \text{Var}_t[g_c] \} + \text{risk premium} - \{ \text{Var}_t[\tilde{g}_c] + \text{convience yield} \}$$
  Risk-free rate $r^{f**} = $
  Discount rate

- total (net) wealth
  $$q_t^K K_t + q_t^B K_t = \mathbb{E}_t \left[ \int_0^\infty \frac{\int_{\xi_t^{**}} \xi_s^i \eta_t^i di}{\int_{\xi_t^{**}} \xi_t^i \eta_t^i di} C_s ds \right]$$
Properties of US primary surpluses
- Average surplus ≈ 0
- Procyclical surplus (> 0 in booms, < 0 in recessions)

Two valuation puzzles from standard perspective:
(Jiang, Lustig, van Nieuwerburgh, Xiaolan, 2019, 2020)
1. “Public Debt Valuation Puzzle”
   - Empirical: $E[PV_\xi(surpluses)] < 0$, yet $\frac{B}{\phi} > 0$
   - Our model: bubble/service flow component overturns results
2. “Gov. Debt Risk Premium Puzzle”
   - Debt should be positive $\beta$ asset, but market don’t price it this way
   - Our model: can be rationalized with countercyclical bubble/service flow
Bond Issuance Rate $\ddot{\mu}^B \Rightarrow$ Fiscal Policy/Tax $s$, Bubble ($r$ vs. $g$)

- Recall
  - Gov. Budget constraint
    \[ \dot{\mu}_t^B B_t^N + \phi_t^n \left( \tau_t^n p_t^n a \kappa_t^N - \frac{1}{2} \varphi_t \right) K_t = 0 \]
  - Real risk-free rate
    \[ r^f = \mu^K - \ddot{\mu}^B \]

- $\ddot{\mu}^B \geq 0 \Rightarrow s \leq 0$ and $r^f < \mu^K$ primary deficit $\forall t \Rightarrow$ Bubble
  - “Mine the Bubble” as long as $\frac{B_t^A}{\phi_t^A} > 0$

- $\ddot{\mu}^B < 0 \Rightarrow s > 0$ and $r^f > \mu^K$ primary surplus $\forall t \Rightarrow$ No Bubble, but service flow
  - $\frac{B_t^A}{\phi_t^A} = \mathbb{E}_t \left[ PV_{r^f}(sK_t) \right]
Roadmap

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  ⇒ “Safe Asset Pricing”
- Constant Idiosyncratic Risk ⇒ Gov. Bonds Perfect Substitutes  
  ⇒ Asymmetric Permanent Exorbitant Privilege
- Risk Shock and its Transition  
  ⇒ Insurance of $S$ by $N$ in the long-run
- Time-varying Idiosyncratic Risk $\tilde{\sigma}_t \in \{\tilde{\sigma}^L, \tilde{\sigma}^H\}$  
  ⇒ Flight-to-Safety Exorbitant Privilege and $\beta^N < \beta^S$  
  ⇒ EMDE Costly Stimulus Policy
- Future: “Battle for the Bubble” + Exchange Rate Policy with Sticky Prices
Government Bonds Perfect Substitutes $\Rightarrow$ G-Bond Portfolio

- For a given debt issuance $\tilde{\mu}_t^B = \mu_t^B - i_t^I$ the country’s primary surplus $s_t^I$ (and tax rate $\tau_t^I$) is determined by country’s government budget constraint.

- For simplicity consider the case where both $\tilde{\mu}_t^B^N$ and $\tilde{\mu}_t^B^S$ are constant.

- **Lemma:**
  $\tilde{\mu}_t^B^N = \tilde{\mu}_t^B^S$, since otherwise one bond has zero value.
  - Real returns on both bonds must be the same,
  - i.e. if bond dilution is higher $\mu_t^B$, country has to offer higher bond interest rate $i_t^I$
  - Citizens in both countries are indifferent between both country’s gov. bonds.

  $\Rightarrow$ Portfolio choice reduces to capital vs. gov bond portfolio: $\theta_t^K$ vs. $(1 - \theta_t^K)$

- **Aside:** less strict if there is a home bias in bond holdings

- Share of one country in the bond portfolio $\vartheta^N$ is constant
  - In symmetric setting $\vartheta^N = \frac{1}{2}$
Optimal Choices & Market Clearing

- **Consumption**
  \[ c_t = \rho n_t \Rightarrow C_t = \rho \left( q_t^K + B_t^N / \phi_t^N + B_t^S / \phi_t^S \right) = \rho \left( q_t^K + B_t^N / \phi_t^N + B_t^S / \phi_t^S \right) = a p^n K_t^N + a p^s K_t^S - \varphi K_t \]

- **Portfolio**
  - For country \( N \)
    \[ 1 - \theta_t^{BN,i} - \theta_t^{BS,i} = \frac{q_t^K K_t^N}{N_t^N} = \kappa_N \left( 1 - \vartheta_t \right) \]
  - For country \( S \)
    \[ ... \]
  - Solve for various \( \theta_t \)'s using for all \( \tilde{\vartheta} \)

- **Goods market**

- **Capital market**

- **Price of risk**
  \[ \frac{\mathbb{E}_t [d r_t^{K,i}]}{dt} - \frac{\mathbb{E}_t [d r_t^{B}]}{dt} = \frac{\tilde{\sigma}_t^{n,i}}{\left( 1 - \theta_t^{BN,i} - \theta_t^{BS,i} \right) \tilde{\sigma}} \]

- **Risk premium (idio)**

- \( \vartheta_t := \frac{B_t^N / \phi_t^N + B_t^S / \phi_t^S}{N_t^N} \)

- \( \eta_t^N := \frac{N_t^N}{N_t} \)
Equilibrium: 3 Key Equations

- **κ Capital Share Allocation**
  \[ \kappa = f \left( \frac{\text{production efficiency}}{\kappa = 1/2}, \text{tax incentive tilt towards country with lower capital taxes} \right). \]

- **dη Net worth Share Evolution**
  \[ d\eta_t = \eta_t (1 - \eta_t) \left[ \left( \frac{\kappa_t}{\eta_t} \right)^2 - \left( \frac{1 - \kappa_t}{1 - \eta_t} \right)^2 \right] (1 - \vartheta_t)^2 \tilde{\sigma}^2 dt = \text{difference in “earned risk premia”} \]

Steady state: \( d\eta = 0 \rightarrow \eta = \kappa \)

- **ϑ Safe Asset Pricing Equation (world)**
  \[ \vartheta_t = \left( \frac{B^N_t}{\vartheta^N_t} + \frac{S_t}{\vartheta^S_t} \right) / N_t \quad \text{“safe asset wealth share”} \]
  \[ \frac{B^N_t}{\vartheta^N_t} = \mathbb{E}_t [ PV** \left( \text{primary surpluses}^N \right) ] + \mathbb{E}_t [ PV** \left( \text{service flows}^N \right) ] \]
  Fraction that is part of country \( N \)'s \( \vartheta^N \): fixed exogenously (equilibrium selection/market coordination)
Stationary Steady State $d\eta_t = 0$ – in closed form

### Monetary

<table>
<thead>
<tr>
<th>Expression</th>
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<tbody>
<tr>
<td>$q^K K_t = \frac{\sqrt{\rho + \bar{\mu}^B}}{\tilde{\sigma}} \left(\frac{\rho}{N_t}\right) (\bar{a} - \varrho) K_t$</td>
</tr>
<tr>
<td>$\frac{B_t^N}{\delta \theta_t^N} = \vartheta^N \left(1 - \frac{\sqrt{\rho + \bar{\mu}^B}}{\tilde{\sigma}}\right) \left(\frac{\rho}{N_t}\right) (\bar{a} - \varrho) K_t$</td>
</tr>
<tr>
<td>$\frac{B_t^S}{\delta \theta_t^S} = (1 - \vartheta^N) \left(1 - \frac{\sqrt{\rho + \bar{\mu}^B}}{\tilde{\sigma}}\right) \left(\frac{\rho}{N_t}\right) (\bar{a} - \varrho) K_t$</td>
</tr>
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</table>

- $\bar{a} = \kappa p^n(\kappa) a + (1 - \kappa) p^s(\kappa) a$, where $\kappa = \kappa^N$, $1 - \kappa = \kappa^S$ and in SS $\eta = \kappa$
- $\rho$ time preference rate; $r^f = \rho + \mu^K + (1 - \vartheta)\tilde{\sigma}^2$;
- $\bar{\mu}^B = \mu_t^B - i_t^I$ bond issuance rate beyond interest rate, same in both countries.

Recall:

- $N_t$ = world net worth
- $\vartheta$ = fraction of world net worth in nominal claims
Capital & Bond Price (Steady State) for Different SS $\bar{\sigma}$

- World

Bond price (real) per unit of $K_t$

Price (real) of capital unit

![Diagram showing bond price and capital price as functions of $\bar{\sigma}$]
Capital & Bond Price (Steady State) for Different SS $\tilde{\sigma}$

- $\vartheta^N = \frac{3}{4}$, $\vartheta^S = \frac{1}{4}$

Benchmark: $\vartheta^N = \frac{1}{2} = \vartheta^S$
Theorem: Country N has a *steady state Exorbitant Privilege* if $\vartheta^N > 1/2$, since it can run a Ponzi Scheme on citizens of country S.

- Country N’s gov. bond supply > country S’s if $\vartheta^N > 1/2$.
- N-citizens gov bond holding < Country N’s bond supply
- S-citizens also hold bubbly safe asset of gov. country S.

⇒ Country N can “mine the N-bubble” (safe asset) at the expense of S-citizens.

**Proof:**

Since $p^n < p^S$ for $\kappa > 1/2$, $\Rightarrow \kappa = \eta < \vartheta^N$, i.e. $\kappa^S = \eta^S > \vartheta^S$ (wealth>bubble share) (apples are cheaper than bananas)

Since portfolio share of bonds $\theta^S$ is the same for all citizens across the world, S-citizens for safe asset/gov. bond exceeds the one issued in country S.
Steady State Capital Share = Net Worth Share for Different $\tilde{\sigma}$

- $\vartheta^N = \frac{3}{4}, \vartheta^S = \frac{1}{4}$ ... Country $N$ has higher net worth share and higher total net worth in the higher idiosyncratic risk environment.

Benchmark: $\vartheta^N = \frac{1}{2} = \vartheta^S$

- net worth share $\eta$, capital share $\kappa$
- net worth of country $N^N$
\( \vartheta^N = \frac{3}{4}, \vartheta^S = \frac{1}{4} \) ... Country \( N \) fiscal deficit is higher and increases more with the higher idio risk environment

- Benchmark: \( \vartheta^N = \frac{1}{2} = \vartheta^S \)

Steady State Gov. Primary Surplus for Different \( \tilde{\sigma} \)
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- Time-invariant Idiosyncratic Risk and  
  ⇒ Asymmetric Permanent Exorbitant Privilege
- \( \tilde{\sigma}_t \)-Risk Shock and its Transition  
  ⇒ Insurance of \( S \) by \( N \) in the long-run
- Time-varying Idiosyncratic Risk \( \tilde{\sigma}_t \in \{ \tilde{\sigma}^L, \tilde{\sigma}^H \} \)  
  ⇒ Flight-to-Safety Exorbitant Privilege and  \( \beta^N < \beta^S \)  
  ⇒ EMDE Costly Stimulus Policy
- Future: “Battle for the Bubble” + Exchange Rate Policy with Sticky Prices
After $\tilde{\sigma}$-shock: “Poor Insure the Rich”

- Unanticipated shock (MIT shock)
- Convergence to new steady state with higher $\tilde{\sigma}$

- At shock impact: Insurance in the **short-run**, since there no impact on $\eta$
  (started at steady state or $\eta$-derivatives)

- After the shock: No insurance of **long-run risk**
  Country $N$’s net worth share and net worth grows subsequently
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Gov. Bonds with Different Risk Profiles

- **Full Dynamic model**
  - $\tilde{\sigma}_t$ is time-varying and jumps between $\tilde{\sigma}^L$ and $\tilde{\sigma}^H$, and jumps are anticipated.
  - Gov. bonds are different, have different $\beta$
  - Asymmetry in level $\vartheta^N > \vartheta^S$ and in slope $\Delta \vartheta^N := \vartheta^N(\tilde{\sigma}^H) - \vartheta^N(\tilde{\sigma}^L) > \vartheta^S(\tilde{\sigma}^H) - \vartheta^S(\tilde{\sigma}^L) \quad \Delta \vartheta^S :=$

Theorem: “Flight-to-Safety Exorbitant Privilege”

If $\vartheta^N > 1/2$ and $\Delta \vartheta^N > \Delta \vartheta^S$

higher $N$-bond issuance (lower taxes) “on average” or even in both states, $\mu^{BN}(\tilde{\sigma}^H) > \mu^{BS}(\tilde{\sigma}^H)$ and $\mu^{BN}(\tilde{\sigma}^L) > \mu^{BS}(\tilde{\sigma}^L)$.

- **Intuition:** Beliefs that $\vartheta^N$ rises in high-risk environment $\Rightarrow \beta^N$ more negative and $\beta^S$ less negative enables gov. $N$ to issue more bonds (lower taxes) all the time.
Full Model: $\tilde{\sigma}$-realization: 2 Exorbitant Privileges

$$\tilde{\sigma}_t$$

Start at $\tilde{\sigma}^L$-SS

$$\eta_t$$

$$\kappa_t$$

$$\mu_t^{BN} - i_t^N > \mu_t^{BS} - i_t^S$$ for all $t$
Country $S$’s Countercyclical Stimulus Policy is Costly

- Suppose country $S$ would like to run fiscal stimulus in high-risk environment $\tilde{\sigma}^H$ as opposed to following $N$’s $\tilde{\mu}_t^{BN}$.

- Result: Country $S$ can enjoy a fiscal stimulus policy in high-risk environment $\tilde{\sigma}^H$ only at the expense of significantly raising taxes in low-risk environment.

- Intuition:
  \[ \tilde{\mu}_t^{BN}(\tilde{\sigma}^H) \uparrow, \text{i.e. issuing more } S\text{-bonds at state } \tilde{\sigma}^H \text{ increases } S\text{-bonds } \beta^S, \text{(lowering its safety)}. \]
  To keep $S$-bond attractive relative to $N$-bond, $\tilde{\mu}_t^{BN}(\tilde{\sigma}^L) \downarrow\downarrow$, $N$-bond issuance has to drop significantly in low risk environment.
Conclusion – Main Takeaways

- **Safe Asset** = good friend provides “service flow”
  - **Individually:** allows self-insurance through retrading
  - **Aggregate:** appreciates in bad times (negative $\beta$)
- **Safe Asset Exorbitant Privilege** makes IMS “unbalanced”
  - Permanent wealth transfer: Country $N$ can “mine the bubble” held by $S$-citizens
  - Risk shock $\Rightarrow$ “poor insure the rich”
    - No immediate redistribution, but $N$’s net worth share grows (long-run risk)
- “Flight-to-Safety Exorbitant Privilege” (2nd Privilege)
- Country $S$ running countercyclical fiscal stimulus is very costly and risk losing its own safe asset status
- **Extension:** Battle for the Bubble depends on policy space and commitment power
- **Extension:** FX intervention with sticky prices + home bias
  - Contrasting: US vs. Switzerland (currency manipulation or correction?)
    - CH has larger incentive to share privilege
Safe Asset: Issuance Privilege vs. Burden

- At normal times: lower $r$ possibly $< g$
- At times of elevation risk:
  - Flight-to-Safety issuance benefits $\uparrow$ interest rate $r$ $\downarrow$
  - Exchange rate $\uparrow$ export/import $\downarrow$

- What does it depend on?
  - Fraction on world safe asset share (relative to country size)
  - (1) price stickiness (form of)
  - (2) home goods bias
  - (3) elasticity of substitution btw. home & foreign goods
FX Interventions: Preview

- Safe asset providing country
  - Holds a common “stock” of foreign bond
  - Increases its holdings in an elevated risk environment

Is not manipulative but stabilizing, as the country shares privilege/“Bubble mining” revenue (helps to keep interest rate low)

- Switzerland has larger incentive to share privilege than US
  - As it helps to stabilize its output gap more

- Conjecture: Buying foreign equity shares adds risk
  - $\beta$ of safe asset is less negative
Price Stickiness ⇒ Exchange Rate Distortions: Overview

- So far, country A’s funding costs declined as $\bar{\sigma}$ rises ⇒ Positive effect
- With price stickiness, exchange rate matters too
  higher safe asset demand for country A debt
  ⇒ larger demand for A currency
  ⇒ A currency appreciates
  - Strong currency hits export and favors imports
  - Output gap becomes negative ⇒ Negative effect
Introducing Price Stickiness

- Prices are sticky in producers’ currency
  - Apple prices are sticky in country A, banana prices are sticky in country B
- Demand effect leads to output gap
  - (over/under) utilization of capital stock

- Contrast two extreme cases:
  - With perfect home bias (America)
  - Without home bias (Switzerland)
Conclusion – Main Takeaways

- **Safe Asset** = good friend provides “service flow”
  - **Individually:** allows self-insurance through retraining
  - **Aggregate:** appreciates in bad times (negative $\beta$)
- Safe Asset Exorbitant Privilege makes IMS “unbalanced”
  - Permanent wealth transfer: Country A can “mine the bubble” held by B-citizens
  - Risk shock $\Rightarrow$ “poor insure the rich”
    - no immediate redistribution, but A’s net worth share grows (long-run risk)
- at times of elevation risk
  - Flight-to-Safety issuance benefits $\uparrow$ interest rate $r$ $\downarrow$
  - Exchange rate $\uparrow$ export/import $\downarrow$
- What does it depend on?
  - Fraction on world safe asset share (relative to country size)
  - (1) price stickiness (form of)
  - (2) home goods bias low (America vs. Switzerland)
  - (3) elasticity of substitution btw. home & foreign goods high
- Rationale for FX intervention: beneficial, but can be loss making for A
- Implication for Monetary Policy Framework (added FX target)