A Global Safe Asset for & from Emerging Economies

Markus Brunnermeier     Lunyang Huang
Princeton University
International: Flight to Safety

- Risk-on, Risk-off
- Flight-to-safe asset

Safe asset:
- “Good friend analogy” is around/valuable when you need it
- Safe asset tautology is safe because it is perceived to be safe
International: Flight to Safety

- Risk-on, Risk-off Flight-to-safe asset

- Problem: Safe asset is \textit{ asymmetrically supplied } by AE

  Flight-to-safety $\rightarrow$ cross-border capital flows
International: Flight to Safety

- Risk-on, Risk-off Flight-to-safe asset

- Problem: Safe asset is asymmetrically supplied by AE

Flight-to-safety \rightarrow \text{cross-border capital flows}
International: Flight to Safety

- Risk-on, Risk-off  Flight-to-safe asset

- Problem: Safe asset is \textit{asymmetrically supplied} by AE
  - Flight-to-safety  \textit{cross-border} capital flows

- At times of global crisis, issuance of new debt
  - For AE \ at inflated prices  eases conditions
  - For EME  at depressed prices  worsens conditions

- Question: Who insures whom?  \textit{“Poor insure rich Paradox”}
  - Correct insurance only if \textit{buffer is large} and debt long-term enough
    so that no new debt issuance needed & sell safe asset/reserves instead
Two Approaches

- **Approach 1:** “Buffer Approach” *(traditional)*
  - Lean against sudden stop (flight-to-safety) capital outflows
  - Precautionary Reserves
  - IMF liquidity lines
  - Central Banks Swap line arrangements

- **Approach 2:** “Rechanneling Approach” *(new proposal)*
  - “Global Safe Asset from & for Emerging Economies” with Lunyang Huang
    (Central Bank of Chile Conference 2017)
    formal analysis
1. “Buffer Approach” via Reserves Holdings

- South East Asia crisis 97/98: Sudden Stop/Flight-to-Safety ⇒ precautionary reserves

Source: Kieran (Wikipedia)
CIA World Factbook data 2011
1. “Buffer Approach” via Reserves Holdings

- South East Asia crisis 97/98: Sudden Stop/Flight-to-Safety ⇒ precautionary reserves
- **Negative carry** due to low yield of safe asset (exorbitant privilege)
  - As EME grows faster, it have to keep acquire foreign safe assets (export surplus required)
- Distorts exchange rates
1. “Buffer Approach” via Reserves Holdings

- South East Asia crisis 97/98: Sudden Stop/Flight-to-Safety ⇒ precautionary reserves

- Negative carry due to low yield of safe asset (exorbitant privilege)
  - As EME grows faster, they have to keep acquire foreign safe assets (export surplus required)

- Distorts exchange rates

- Subsidizes private carry trades
  - Carry traders undermine/undo official reserve holding
    - EME corporate sector $-borrowing
      - Bruno & Shin 2016
    - Hungarian/Polish household €-borrowing
      - Verner 2017
1. “Buffer Approach” via Reserves Holdings

- **South East Asia crisis 97/98: Sudden Stop/Flight-to-Safety** ⇒ precautionary reserves
- **Negative carry** due to low yield of safe asset (exorbitant privilege)
  - As EME grows faster, they have to keep acquire foreign safe assets (export surplus required)
- **Distorts exchange rates**
- **Subsidizes private carry trades**
  - Carry traders undermine/undo official reserve holding
2. Approach: “Rechanneling”

- Address root cause: Safe asset is supplied asymmetrically
- Analogy
2. Approach: “Rechanneling”

- Address root cause: Safe asset is supplied asymmetrically

- Analogy
2. Approach: “Rechanneling”

- Address root cause: Safe asset is supplied asymmetrically

- Analogy
  - Two lines of defense
    - Stronger inner circle (keep)

![Diagram of a fortress and siege]
2. Approach: “Rechanneling”

- Address root cause: Safe asset is supplied asymmetrically

- Analogy
  - Two lines of defense
    - Stronger inner circle (keep)
  - Flight-to-safety (weakens defense)
  - Safe Haven
  - Under attack/siege
2. Approach: “Rechanneling”

- Address root cause: Safe asset is supplied asymmetrically

Diagram: Pool of Sovereign Bonds
2. Approach: “Rechanneling”

- Address root cause: Safe asset is supplied asymmetrically

- Create globally supplied safe asset via pooling & tranching
2. Approach: “Rechanneling”

- Address root cause: Safe asset is supplied asymmetrically

- Create globally supplied safe asset via pooling & tranching

- Expand ESBies idea for euro area to EME: “SBBS (Sovereign-Bond Backed Securities) for the world”
  Euro-nomics group 2011, 2016, 2017
International: Flight to Safety

- Risk-on, Risk-off: Flight to safe asset

- Channels back some of flight-to-safety capital flows
  - Fewer cross-border capital flows

- Who insures whom? (rich the poor?)
  - At times of global crisis issue new debt
    - For AE: at inflated prices
    - For EME: at depressed prices

- Question: is buffer large (long-term) enough such that no new debt issuance needed & sale off safe asset
RoadMap

- Motivation
  - International: Flight to Safety

- Model Setup
  - Illustration
  - More detail

- Policy Analysis
  - Foreign Reserves: Buffering Approach
  - Tranching: Rechanneling Approach

- Global Safe Asset *from & for* Emerging Market Economies
Model Setup

- 3 Dates: $t = 0, 1, 2$

- Agents: entrepreneurs, households and foreigners

- Assets: Productive capital, domestic bonds and dollars

- Timeline:

  - Debt issuance
  - Invest in capital
  - Sunspot
  - (Possible) Flight to Safety Crisis
  - Capital payoffs
  - Debt repayment/default

$t = 0$  $t = 1^-$  $t = 1^+$  $t = 2$
Assets

- Capital:
  - Only entrepreneurs can invest at $t = 0$
  - Output only at $t = 2$:
    - Entrepreneurs: $y_2^E = \tilde{A}K_1^E$; Foreigners: $y_2 = \eta\tilde{A}K_1^*$ ($\eta < 1$)
  - From $t = 1$, capital can be traded among agents, price $q_t$
  - TFP Shock:
Assets con’t

- **Domestic Bonds:**
  - The government issues zero coupon bonds at $t = 0$
  - Mature at $t = 2$ with a total face value $B_0$
  - Traded at $t = 0,1$ at price $p_t$
  - The government can repay up to a maximal lump-sum tax $T_2 = \tau \tilde{A}K_1^E$
    i.e., $Repayment = \max \{B_0, T_2\}$
  - Is perceived “safe” when bonds are not expected to be default

- **Dollars/ Treasuries:**
  - Outside storage technology offers return $R^\$ per period
  - Low risk-free yield
Agents

- Domestic Entrepreneurs
  - Risk-neutral preferences:
    \[
    \max E_0[C_0 + \beta C_1 + \beta^2 C_2]
    \]
  - The only agent that can invest in capital at \( t = 0 \)
  - (Exogenous) Safe asset demand/constraint:
    \[
    S_t^E \geq \beta^{2-t} \alpha K_t^E
    \]
  - Possible safe assets:
    - dollars, domestic bonds when they are nearly default free
  - Prefer to invest minimal dollars: \( \frac{1}{R^S} > \beta \)
  - Low Initial wealth \( W_0^E \), not enough to buy all domestic bonds
Agents con’t

- **Domestic households**
  - The same preference as entrepreneurs
  - Can not hold capitals
  - Initial wealth $W_H^0$, buys the rest of domestic bonds at $t = 0$

- **Foreigners**
  - Similar preference: $\max E_0[C_0 + \beta^* C_1 + \beta^{*2} C_2]$
  - Less patient than entrepreneurs: $\frac{1}{R} > \beta > \beta^*$

- **Additionally:**
  - For simplicity, crisis is unanticipated at $t = 0$
  - Debt-capital ratio $d = \frac{B^0}{K_0}$, $b^E = \frac{B^E_0}{K_0}$, $b^H = \frac{B^H_0}{K_0}$
    $d = b^E + b^H$
Equilibrium at $t = 0$

- **Entrepreneurs:**
  - For sufficiently high $\tilde{A}$, prefer Capital > Domestic bonds > consumption > dollars
  - Hold domestic bonds for safe asset constraint: $b^E = \frac{B_0^E}{K_0} = \alpha$

- **Households:**
  - Buy all residual bonds supply
  - Indifferent between consumption and bonds: $p_0 = \beta^2, b^H = d - \alpha$

- **Foreigners:**
  - Holding nothing due to impatience (low valuation)

- **Equilibrium going forward depends on realization of TFP shock**
Equilibrium at $t = 1$

- Three possibilities:
  - $\bar{A}$ subgame equilibrium:
    - Fundamental is strong, no crisis
\( \bar{A} \) subgame equilibrium at \( t = 1 \)

- Similar to equilibrium at \( t = 0 \)
- Strong fundamental (\( \bar{A} \)) guarantees government repayment
- Asset positions unchanged
- Asset price changes due to time discounting:
  \[ q_{1,u} = \beta \bar{A}, p_{1,u} = \beta \]
Equilibrium at \( t = 1 \)

- Three possibilities:
  - Fundamental \( E_1 \bar{A} \) equilibrium:
    - Weak fundamental, but no sunspot triggers crisis
Fundamental $E_1[\bar{A}]$-equilibrium at $t = 1$

- Similar to equilibrium at $t = 0$

- Weak fundamental ($\bar{A}$) but market confidence makes government repayment self-fulfilling

- Asset positions unchanged

- Asset price changes due to time discounting:
  \[ q_{1,f} = \beta E_1[\bar{A}], p_{1,f} = \beta \]
Equilibrium at $t = 1$

- Three possibilities:
  - Flight-to-Safety equilibrium:
    - Weak fundamental, sunspot triggers crisis
Flight-to-Safety equilibrium at $t = 1$

- **Flight to Safety:**
  - Entrepreneurs seek dollars
  - Sell capital and bonds to foreigners at discounted price
    $$ q_{1,s} = \beta^* \eta E_1[\tilde{A}] < q_{1,f} E_1[\tilde{A}], $$
    Impatience
    $$ p_{1,s} = \beta^* (1 - \pi_2 \frac{h}{\eta}) $$
    Inefficiency
    - Entrepreneurs hold capital
      $$ K_{1,s}^E = \frac{q_{1,s}K_0 + p_{1,s}B_0^E}{q_{1,s} + \alpha \beta} = \frac{\beta^* \eta E_1[\tilde{A}] + \beta^* (1 - \pi_2 h) b^E}{\beta^* \eta E_1[\tilde{A}] + \alpha \beta} K_0 = K_{1,s}^E(h) $$

- **Self-fulfilling default:**
  - Assume default happens only if $A$ realizes (No default for $\overline{A}$)
  - Endogenous debt haircut:
    $$ B_0 (1 - h) = \tau A K_{1,s}^E \leftrightarrow d (1 - h) = \tau A \frac{K_{1,s}^E(h)}{K_0} $$
  - Crisis existence condition: $h > 0$
  - In Fundamental $E_1[\tilde{A}]$ equilibrium: $d < \tau A$
Self-fulfilling Debt Crisis

Minimal tax revenue in normal times \( \tau A \)

Debt repayment \( d(1 - h) \)

Minimal tax revenue in crisis times \( \tau \underline{A} K_{1,s}^E (h)/K_0 \)

Haircut \( h \)
Crisis vulnerability and Severity

- Let \( x \) be the policy parameter
- Crisis vulnerability:
  - The area of \( d \) (indebtedness) where a flight-to-safety crisis exists
  - Intuition: For sufficiently low \( d \), implied \( h(d) < 0 \)
  - In the baseline model:
    \[
    V^B(x) = \max\{\alpha, d^b\}, \tau A \]
    \( d^b \) solves \( h(d^b) = 0 \)
- Crisis Severity:
  - The fraction of capital fire sold in a crisis
  - Output loss is linear in this measure
  - In the baseline model:
    \[
    S^B(x) = \max\left\{0, \frac{\beta \eta E_1[\breve{A}] + (1 - \pi_2) \beta \alpha}{\beta \eta E_1[\breve{A}] + \beta \alpha - \tau A \beta \pi_2 \alpha} \right\}
    \]
- Later analyze how policies affect these measure
RoadMap

- Motivation
  - International: Flight to Safety

- Model Setup
  - Illustration
  - More detail

- Policy Analysis
  - Foreign Reserves: Buffering Approach
  - Tranching: Rechanneling Approach

- Global Safe Asset *from & for* Emerging Market Economies
Foreign Reserves

- Implementation:
  - The gov can issue additional bonds (purchased by households) for purchasing reserves
  - Face value of additional bonds: $b^R K_0$
  - Since $p_0 = 1/\beta^2$, reserves worth $\frac{R^2}{\beta^2} b^R K_0$

- Benefit-cost analysis:
  - Given debt hair cut $h^R$,
    $$\frac{R^2}{\beta^2} b^R K_0 - (1 - h^R) b^R K_0 = \left(\frac{R^2}{\beta^2} - 1\right) b^R K_0 + \frac{h^R b^R K_0}{\text{negative carry}} + \frac{h^R b^R K_0}{\text{debt forgiveness}}$$
Equilibrium

- Subgame equilibriums without crisis is similar

- Focus on flight-to-safety crisis with reserves
  - Fire-sale of capital the same as in baseline
    \[
    K_{1,s}^E = \frac{q_{1,s}K_0 + p_{1,s}B_0^E}{q_{1,s} + \alpha\beta} = \frac{\beta^*\eta E_1[\bar{A}] + \beta^*(1 - \pi_2 h^R)b^E}{\beta^*\eta E_1[\bar{A}] + \alpha\beta}K_0 = K_{1,s}^E(h^R)
    \]
  - Endogenous haircut \( h^R \):
    \[
    (b^e + b^h)(1 - h^R) + b^R(1 - h^R) = \tau A \frac{K_{1,s}^E(h)}{K_0} + b^R(\beta^2 R^2)
    \]
Equilibrium

- Subgame equilibriums without crisis is similar

- Focus on flight-to-safety crisis with reserves
  - Fire-sale of capital the same as in baseline
    
    \[
    K^E_{1,s} = \frac{q_1,sK_0+p_1,sB_0^E}{q_1,s+\alpha\beta} = \frac{\beta*\eta E_1[\bar{A}]+\beta^*(1-\pi_2h^R)b^E}{\beta*\eta E_1[\bar{A}]+\alpha\beta}K_0 = K^E_{1,s}(h^R)
    \]
  - Endogenous haircut \(h^R\):
    
    \[
    (b^e+b^h)(1-h^R) + b^R(1-h^R) = \tau A \frac{K^E_{1,s}(h)}{K_0} + b^R(\beta^2 R^2)
    \]

  - Crisis existence condition: \(h^R > 0\)
Self-fulfilling Debt Crisis (With Reserves)

Minimal tax revenue in normal times $\tau_A$

Carry Cost $b^R(1 - (\beta R^s)^2)$

Debt repayment $d(1 - h)$

Carry Cost $b^R(1 - (\beta R^s)^2)$

Minimal tax revenue in crisis times $\tau_A K_{1,s}^{E}(h)/K_0$

Haircut $h$

$h^R$

$h^*$
Crisis vulnerability and Severity (With Reserves)

- $b^R$ is the policy parameter here
- Crisis vulnerability:
  - Compare to baseline:
    \[ V^R(b^R) \supset V^B \]
  - Intuition: At $h^R = 0$, no debt forgiveness but negative carry

- Crisis Severity:
  - Compare to baseline:
    \[ S^R(b^R) \leq S^B \iff h^R \geq 1 - (\beta R^\$)^2 \iff h \geq 1 - (\beta R^\$)^2 \]
  - Intuition: If crisis is severe enough, debt forgiveness creates gain that exceeds negative carry
RoadMap

▪ Motivation
  • International: Flight to Safety

▪ Model Setup
  • Illustration
  • More detail

▪ Policy Analysis
  • Foreign Reserves: Buffering Approach
  • Tranching: Rechanneling Approach

▪ Global Safe Asset from & for Emerging Market Economies
Tranching

- **Implementation:**
  - Set up a SPV that purchases government bonds and issues a senior and junior bond.
  - Default loss is first absorbed by junior bonds.
  - Total face value of senior bonds: $sK_0 < dK_0$
  - Assume $s > \alpha$, entrepreneurs are fully protected.
  - Notations: $b^{S,E}, b^{S,H}, b^{J,E}, b^{J,H}$

- **Benefit-cost analysis:**
  - No cost within the model.
  - Senior bonds are less likely to lose safe-asset-status.
  - Owners of senior bonds (E) recover larger value even in defaults.
Equilibrium

- Subgame equilibriums without crisis is similar
  - At $t = 0$, junior bonds and senior bonds are perfect substitutes
  - Assume entrepreneurs slightly prefer senior bonds

- Focus on flight-to-safety crisis here
  - Senior bonds haircut $h^S > 0 \iff h^J = 1$ (Junior bonds wiped out)
  - Fire-sale of capital the same as in baseline

$$K_{1,s}^E = \frac{q_{1,s}K_0 + p_{1,s}B_0^{S,E}}{q_{1,s} + \alpha \beta} = \frac{\beta^* \eta E_1[A] + \beta^*(1 - \pi_2 h^S)b^{S,E}}{\beta^* \eta E_1[A] + \alpha \beta} K_0 = K_{1,s}^E(h^S)$$

- Endogenous haircut $h^S$:
  - Baseline: $(b^E + b^H)(1 - h) = d(1 - h) = \tau A \frac{K_{1,s}^E(h)}{K_0}$

- Crisis existence condition: $h^S > 0$
Equilibrium

- **Subgame equilibriums without crisis is similar**
  - At $t = 0$, junior bonds and senior bonds are perfect substitutes
  - Assume entrepreneurs slightly prefer senior bonds

- **Focus on flight-to-safety crisis here**
  - Senior bonds haircut $h^S > 0 \iff h^J = 1$ (Junior bonds wiped out)
  - Fire-sale of capital the same as in baseline

\[
K_{1,s}^E = \frac{q_{1,s}K_0 + p_{1,s}B_0^{S,E}}{q_{1,s} + \alpha \beta} = \frac{\beta^* \eta E_1[\bar{A}] + \beta^* (1 - \pi_2 h^S)b^{S,E}}{\beta^* \eta E_1[\bar{A}] + \alpha \beta} K_0 = K_{1,s}^E(h^S)
\]

- Endogenous haircut $h^S$:
  - Tranching: $(b^{S,E} + b^{S,H})(1 - h^S) = s(1 - h^S) = \tau A \frac{K_{1,s}^E(h^S)}{K_0}$

\[
\begin{align*}
  h^S & \text{ can be solved from baseline model assume } d = s \\
  \text{Crisis existence condition: } h^S & > 0 \\
  \text{Tranching is equivalent to eliminate } d - s \text{ debt burden in crisis}
\end{align*}
\]
Crisis vulnerability and Severity (With Tranching)

- $s$ is the policy parameter here
  - But $\alpha \leq s \leq d$

- Crisis vulnerability:
  - Compare to baseline:
    $$V^T(s) = V^B|_{d=s} \subset V^B$$

- Crisis Severity:
  - Compare to baseline:
    $$S^T(s) = S^B|_{d=s} \leq S^B$$
RoadMap

- Motivation
  - International: Flight to Safety

- Model Setup
  - Illustration
  - More detail

- Policy Analysis
  - Foreign Reserves: Buffering Approach
  - Tranching: Rechanneling Approach

- Global Safe Asset *from & for* Emerging Market Economies
Tranching and Pooling

- Tranching can be strengthened via diversifying local shock
  - generalize the model to a continuum of ex-ante identical countries
- Set up international SPV to implement GloSBBies
Policy Analysis (Tranching & Pooling)

- $s$ (senior bonds/capital) is the policy parameter
  - But $\alpha \leq s \leq d$

- Crisis vulnerability:
  - Crisis exists iff
    \[
    s > (1 - \pi^i_2) \quad d + \pi^i_2 \quad \frac{d^B}{\_\_} \\
    \text{Issued safe asset} \quad \text{repayment of default free country} \quad \text{repayment of defaulted country}
    \]
  - For national tranching, crisis exists iff
    \[ s > d^B \]

- Crisis Severity:
  - Compare to national tranching:
    \[ S_{GloSBies}^T(s) < S^T(s) = S^B |_{d=s} \leq S^B \]
## Conclusion

### High Debt Level
- **Domestic Challenge:** Central Bank independence
- **International Challenge:** Flight-to-Safety

### Global Financial Architecture
- **Buffer approach**
  - Reserve holding: interventionistic (costly due to cost of carry & distortionary)
  - IMF support: very limited
  - Swap lines: Limited (not all IMF member countries)
- **Rechanneling approach**
  - Self-stabilizing (autonomous)

### Tranching completes the market
- Allows catering to investors groups with different risk attitudes
- Makes EME less crisis prone

### International pooling and tranching
- SBBS/ESBies for the world
- Expands IMF’s fire power
**Extra Slide: Safe assets**

- **“Good friend analogy”** - like reserve assets
  - Safe/available at any horizon - “when it counts”
  - Precautionary buffer
    - held in addition to more risky assets
    - Risk↑ ⇒ demand for safe assets ↑

- **“Safe asset tautology”**
  - Safe because it is “perceived to be safe”
  - Safe independent of fundamentals
    - US Treasuries downgrade by S&P in 2011 ⇒ yield ↓
    - German CDS spread ⇒ yield, during Euro crisis
  - Multiple equilibria
  - Bubble
Model Setup

- Three Dates: $t = 0, 1, 2$

- **Time 0:**
  - The government issues bonds maturing in date 2
  - Domestic agents invest capital and buy domestic bonds

- **Time 1:**
  - Potential flight-to-safety crisis
  - Capital and domestic bonds are fire sold to foreigners

- **Time 2:**
  - Capital produces output
  - The government partially defaults if tax revenue < maturing bonds

---

Debt issuance
Invest in capital

Sunspot

(Possible) Flight to Safety Crisis

Capital payoffs
Debt repayment/default

$t = 0$
$t = 1^-$
$t = 1^+$
$t = 2$