A Global Safe Asset for & from Emerging Economies

Markus Brunnermeier Lunyang Huang

Princeton University

Brunnermeier & Huang

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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

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- Problem: Safe asset is *asymmetrically supplied* by AE

  Flight-to-safety ➡ cross-border capital flows

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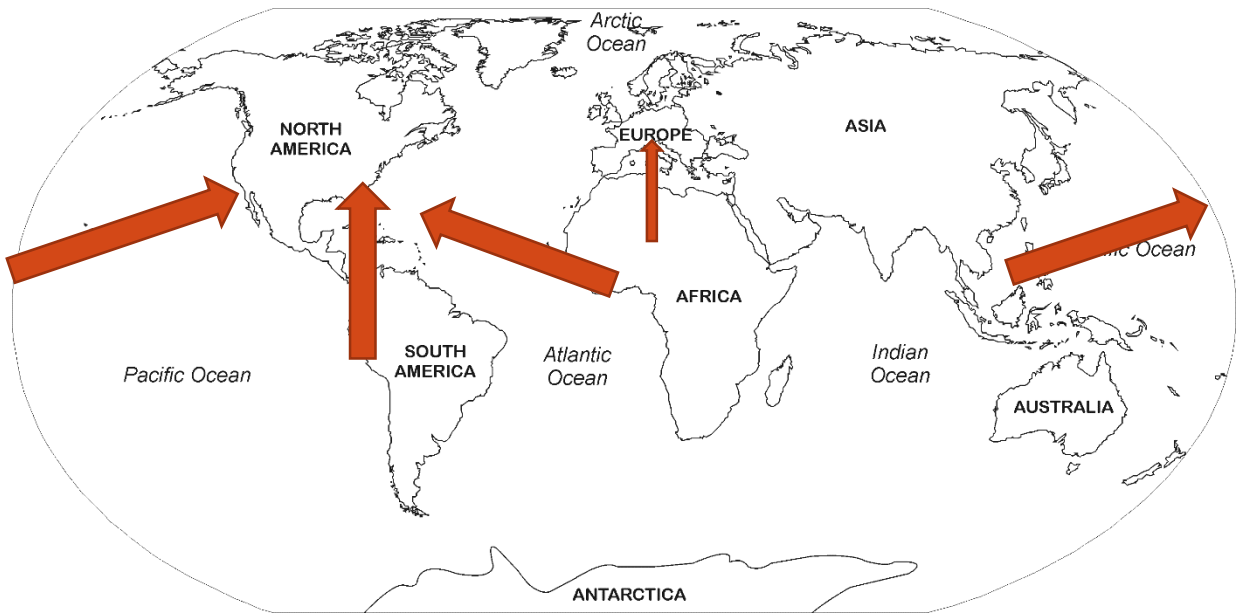
  Flight-to-safety → cross-border capital flows



International: Flight to Safety

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  Flight-to-safety ➡ 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? *"Poor insure rich Paradox"*
  - Correct insurance only if
    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

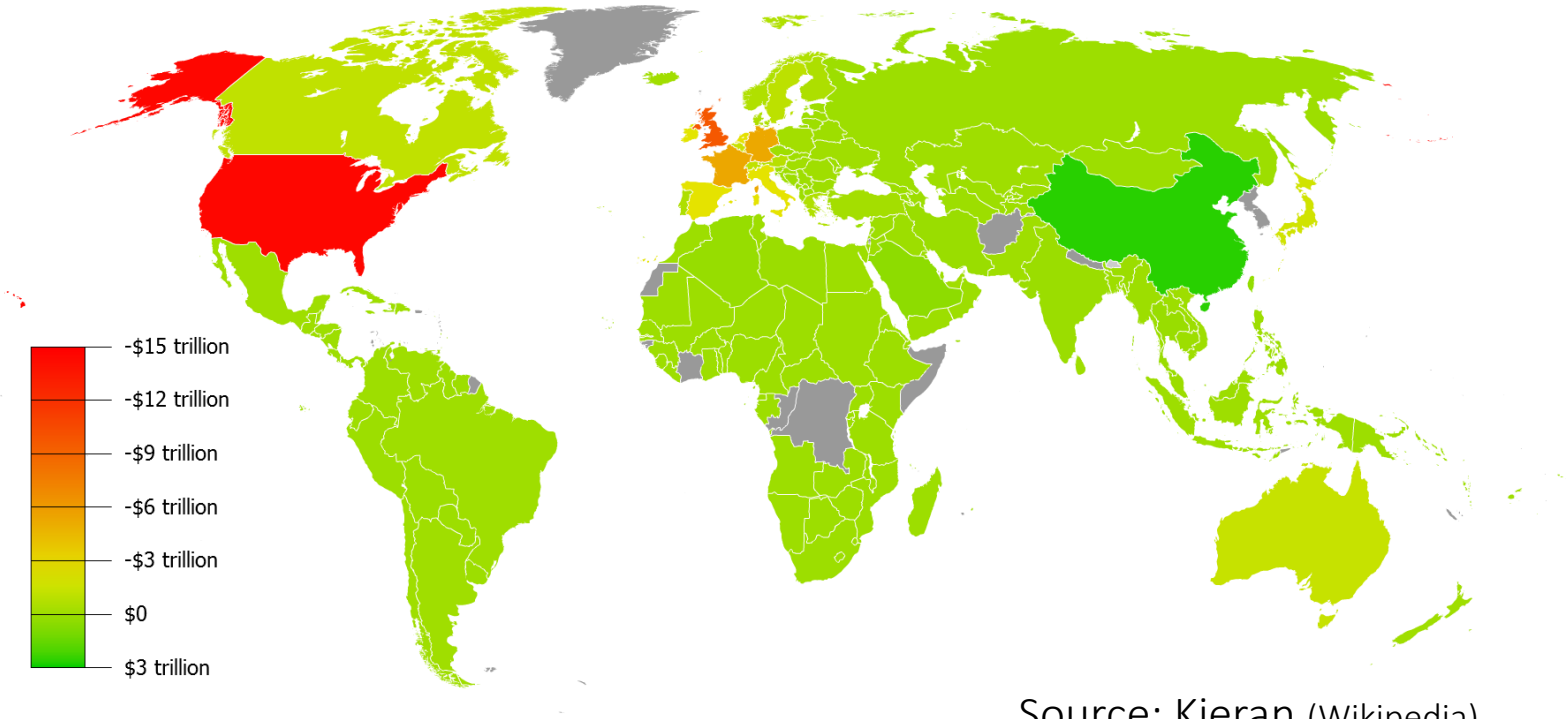
  - Precautionary Reserves
  - IMF liquidity lines
  - Central Banks Swap line arrangements

  } Official sector

- 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

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- 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

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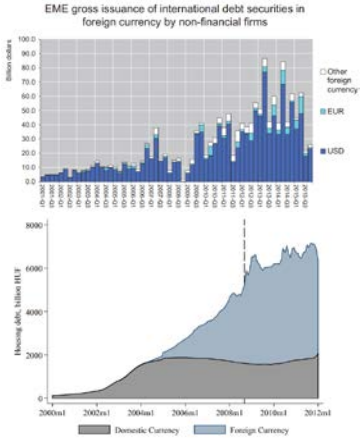
  - As EME grows faster, they have to keep acquire foreign safe assets (export surplus required)
- Distorts exchange rates
- Subsidizes private carry trades
  - Carry traders undermine/undo official reserve holding
  - EME corporate sector $-borrowing
    - Bruno & Shin 2016
  - Hungarian/Polish household €-borrowing
    - Verner 2017



(b) Housing debt in domestic and foreign currency

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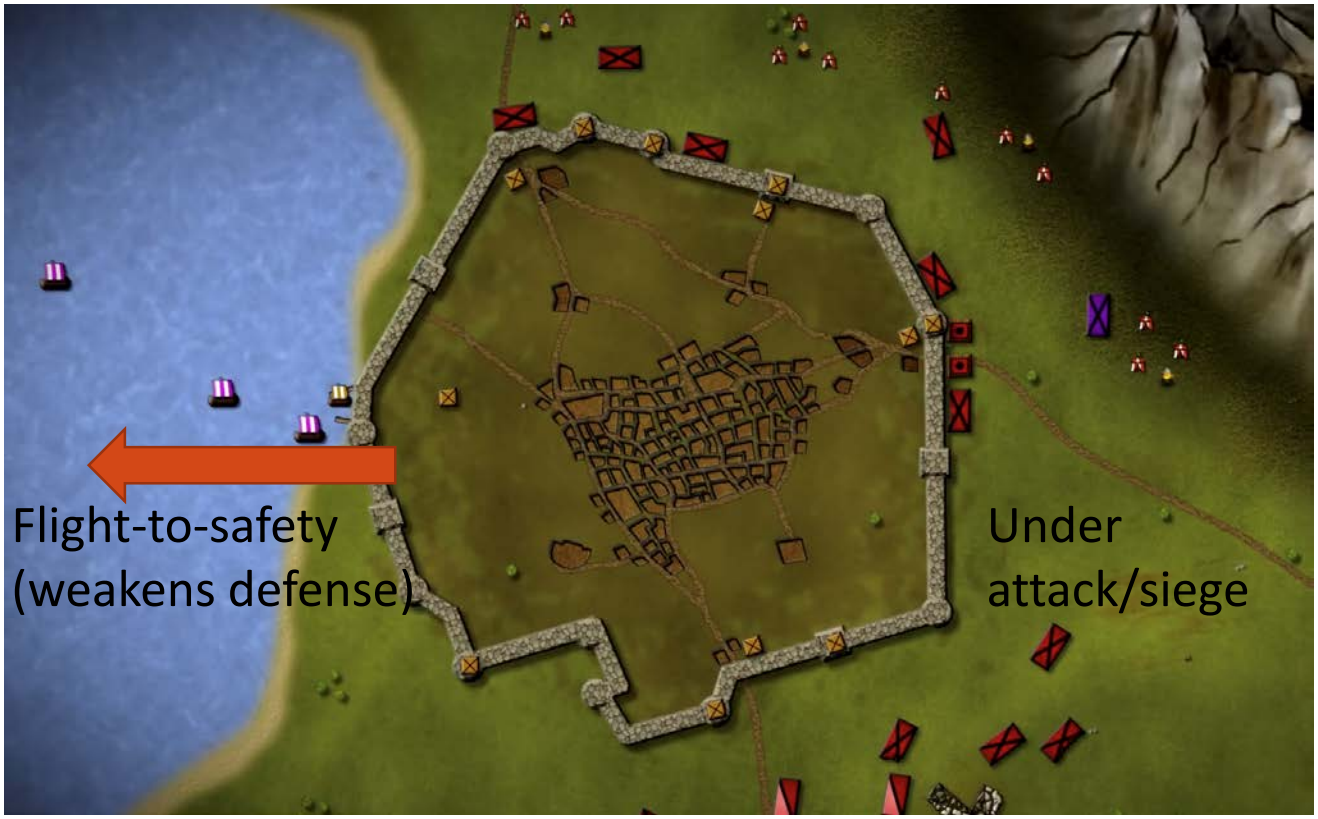

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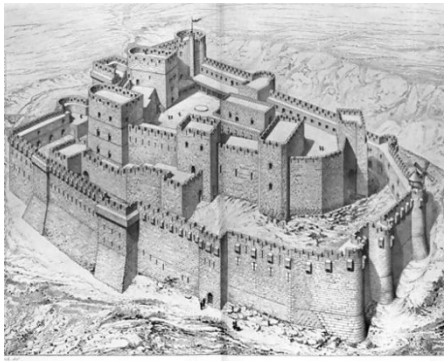
- Address root cause: Safe asset is supplied asymmetrically

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



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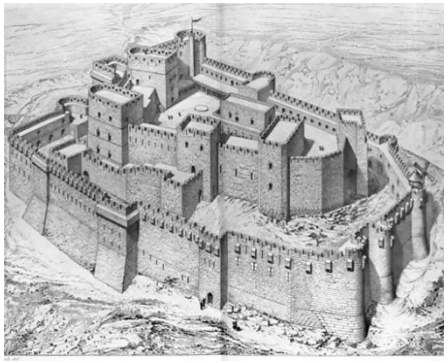

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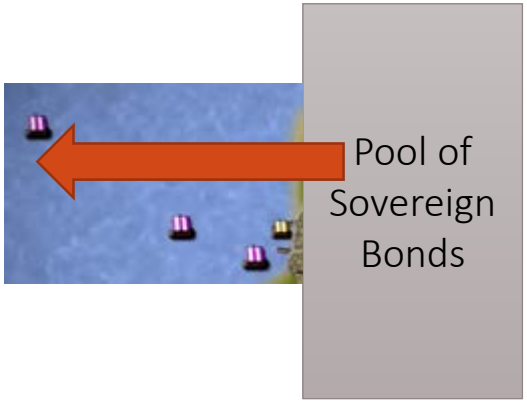

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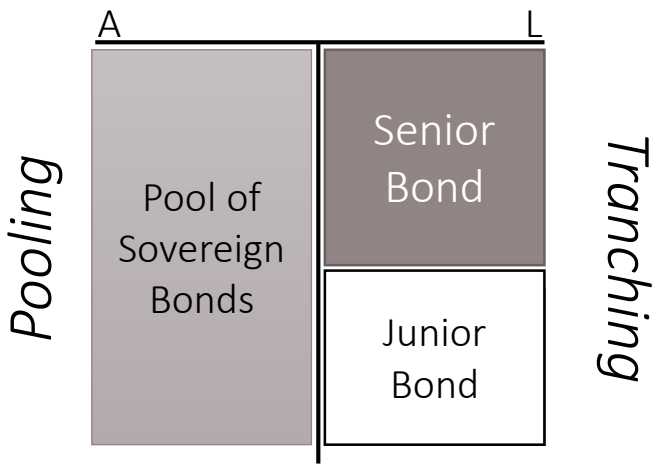
- Address root cause: Safe asset is supplied asymmetrically

- Create globally supplied safe asset via pooling & tranching



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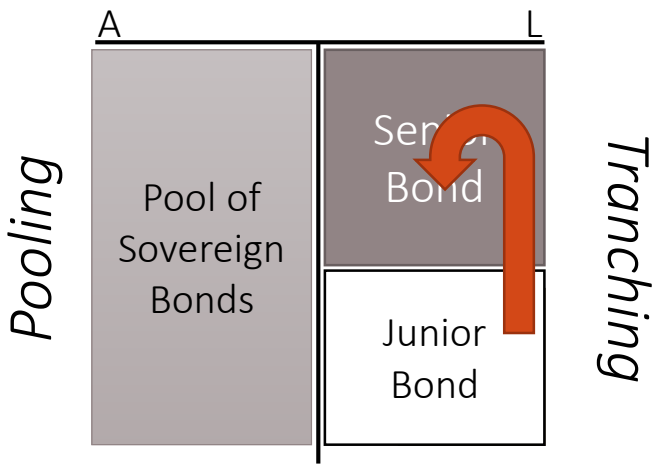


Rechannel:
Instead of cross-border
Across asset classes

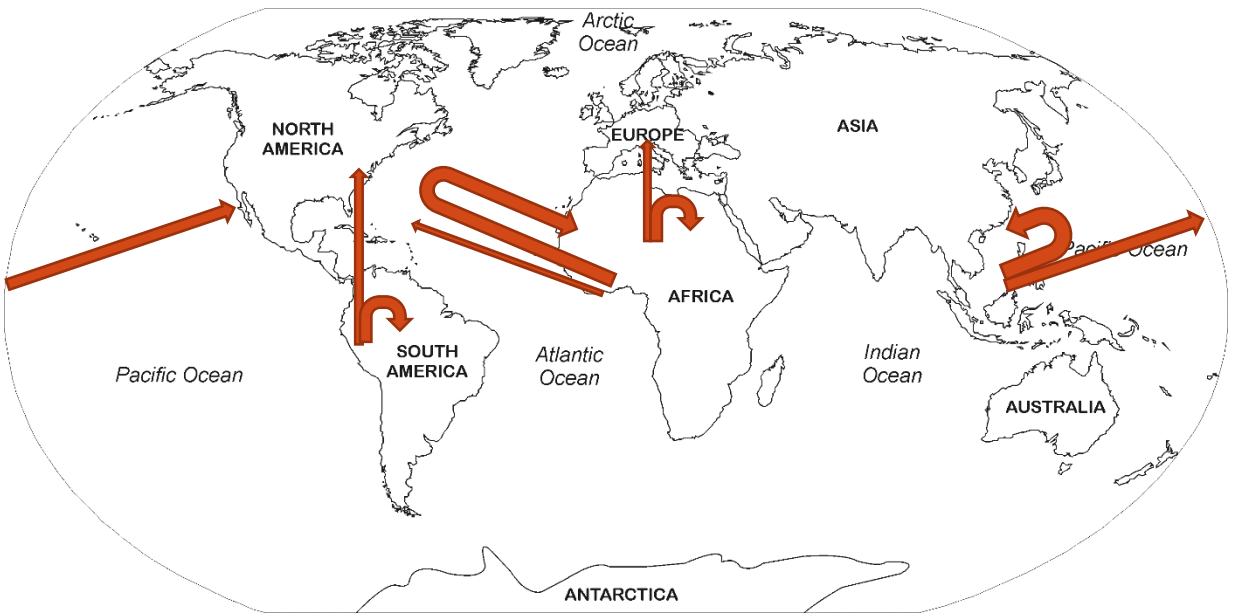
- Expand ESBies idea for euro area to EME:
  "SBBS (Sovereign-Bond Backed Securities) for the world"
  Euro-nomics group 2011, 2016, 2017

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



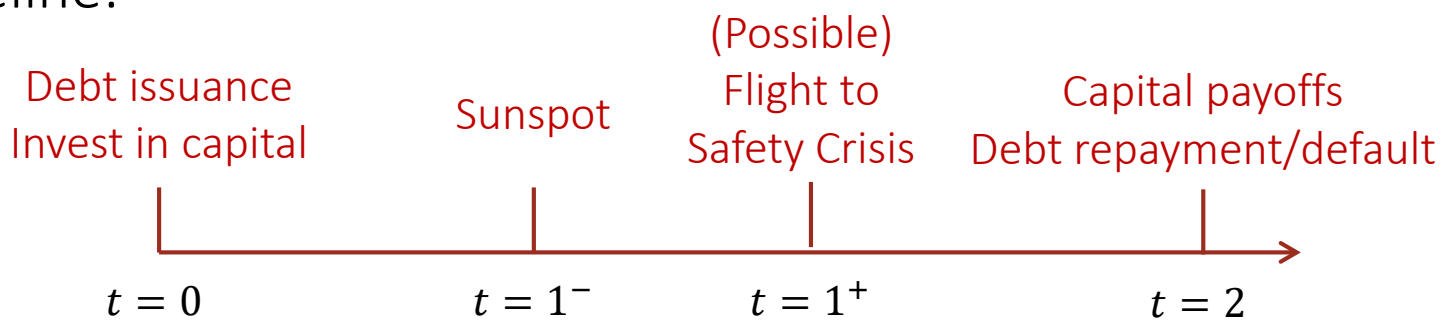
Brunnermeier & Huang

RoadMap

- Motivation
  - International: Flight to Safety
- Model Setup
  - Ilustration
  - More detail
- Policy Analysis
  - Foreign Reserves: Buffering Approach
  - Tranching: Rechanneling Approach
- Global Safe Asset *from & for* Emerging Market Economies

Model Setup

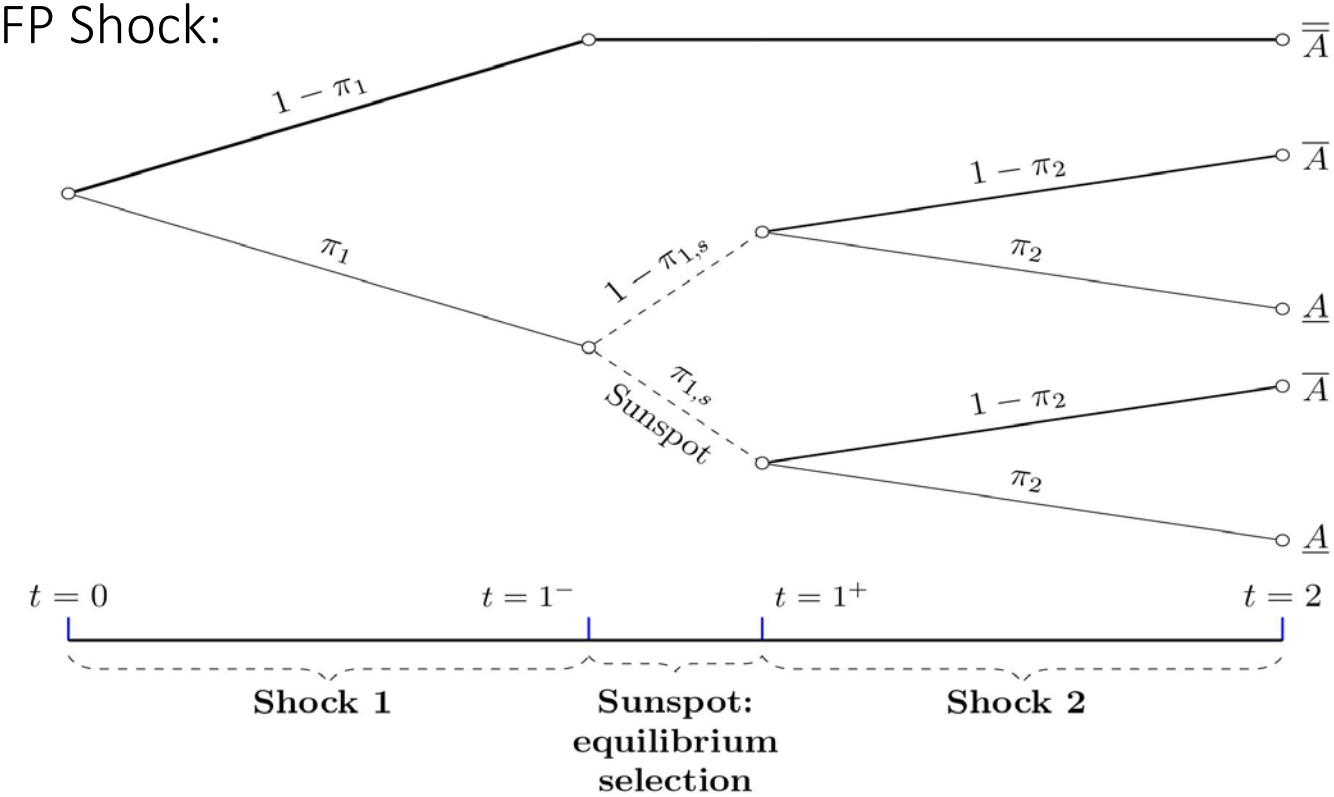
- 3 Dates: t = 0,1,2
- Agents: entrepreneurs, households and foreigners
- Assets: Productive capital, domestic bonds and dollars
- Timeline:



More Detail

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:
    $$\max \mathrm{E}_0[C_0 + \beta C_1 + \beta^2 C_2]$$
  - 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: $\frac{1}{R^{\$}} > \beta$
  - 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_0^H, buys the rest of domestic bonds at $t = 0$
- Foreigners
  - Similar preference: $\max \mathrm{E}_0[C_0 + \beta^* C_1 + {\beta^*}^2 C_2]$
  - Less patient than entrepreneurs: $\frac{1}{R^\$} > \beta > \beta^*$
- Additionally:
  - For simplicity, crisis is unanticipated at $t = 0$
  - Debt-capital ratio $d = \frac{B_0}{K_0}$, $b^E = \frac{B_0^E}{K_0}$, $b^H = \frac{B_0^H}{K_0}$

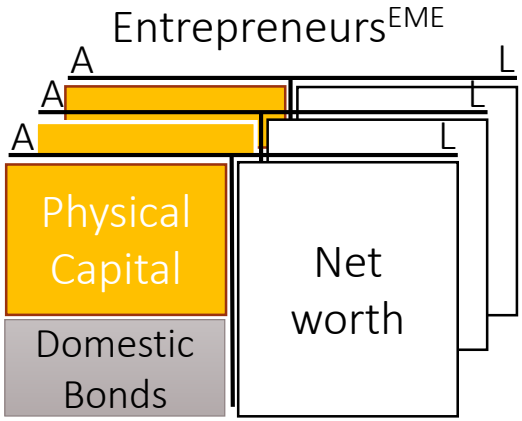
$$d = b^E + b^H$$

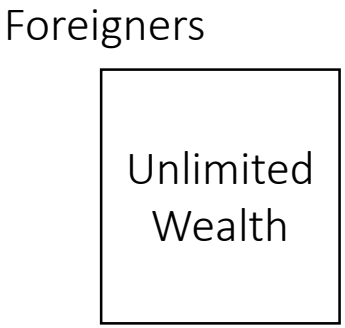
Equilibrium at $t = 0$

- Entrepreneurs:
  - For sufficiently high $\tilde{A}$, prefer

Capital > Domestic bonds > consumption > dollars

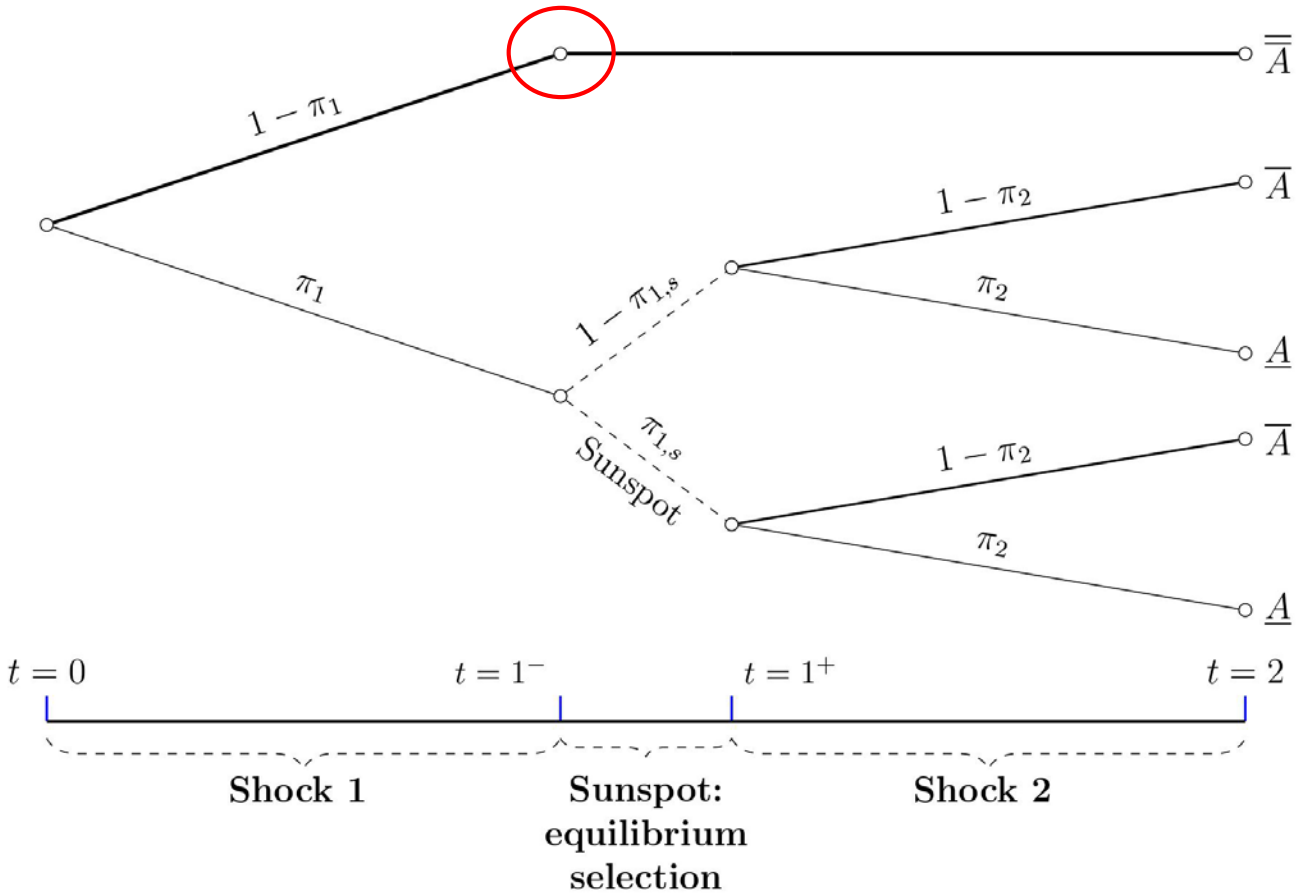
  - Hold domestic bonds for safe asset constraint: $b^E = \frac{B_0^E}{K_0} = \alpha$
- Households:
  - Buy all residual bonds supply
  - Indifferent between consumption and bonds: $p_0 = \beta^2, b^H = d - \alpha$
- Foreigners:
  - Holding nothing due to impatience (low valuation)
- Equilibrium going forward depends on realization of TFP shock





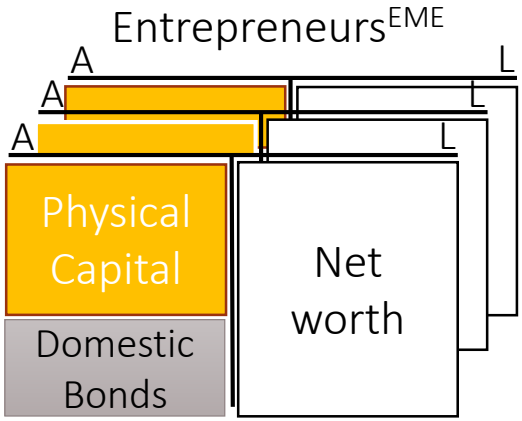
Equilibrium at $t = 1$

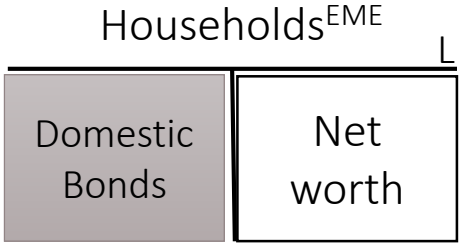
- Three possibilities:
  - $\bar{\bar{A}}$ subgame equilibrium:
    - Fundamental is strong, no crisis



$\bar{\bar{A}}$ subgame equilibrium at $t = 1$

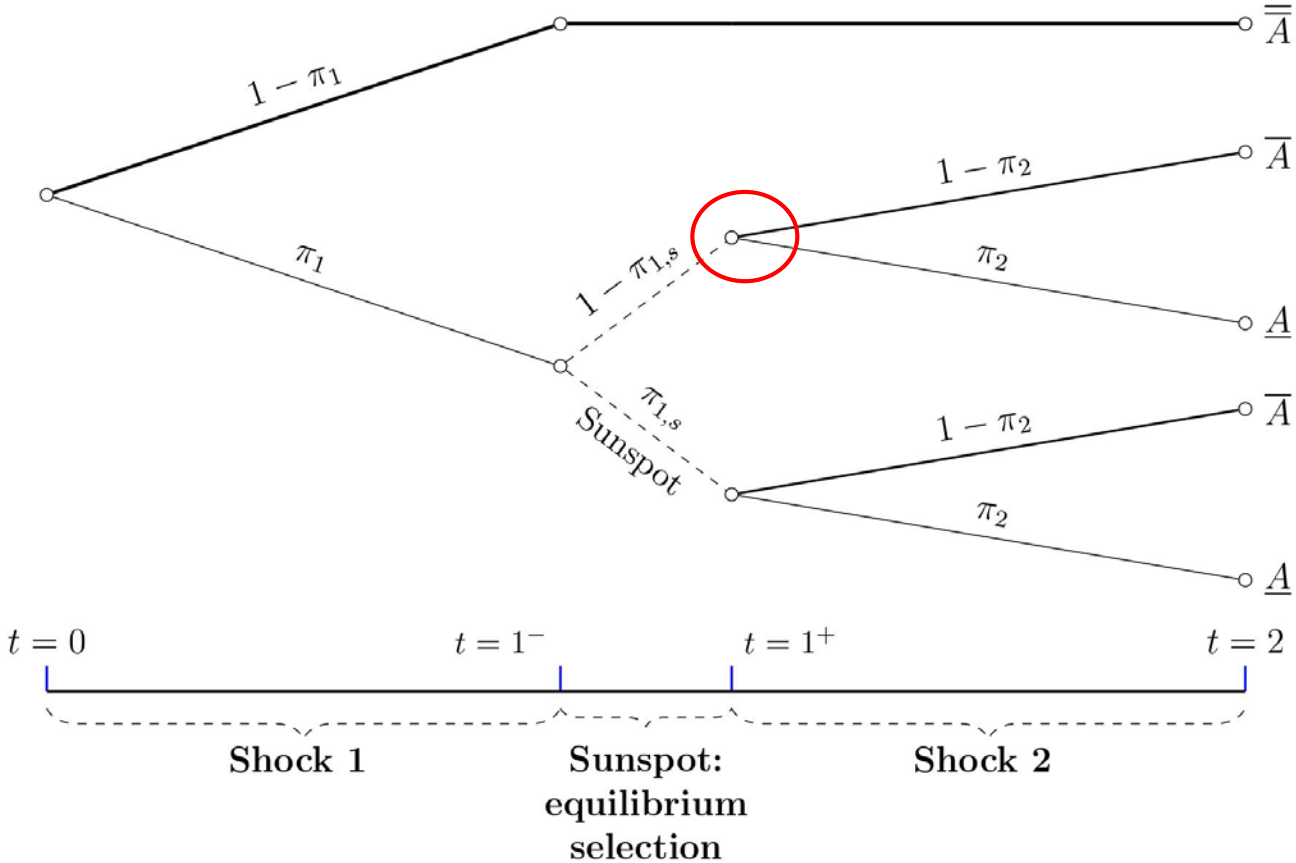
- Similar to equilibrium at $t = 0$
- Strong fundamental ($\bar{\bar{A}}$) guarantees government repayment
- Asset positions unchanged
- Asset price changes due to time discounting:
  - $q_{1,u} = \beta\bar{\bar{A}}\,, p_{1,u} = \beta$





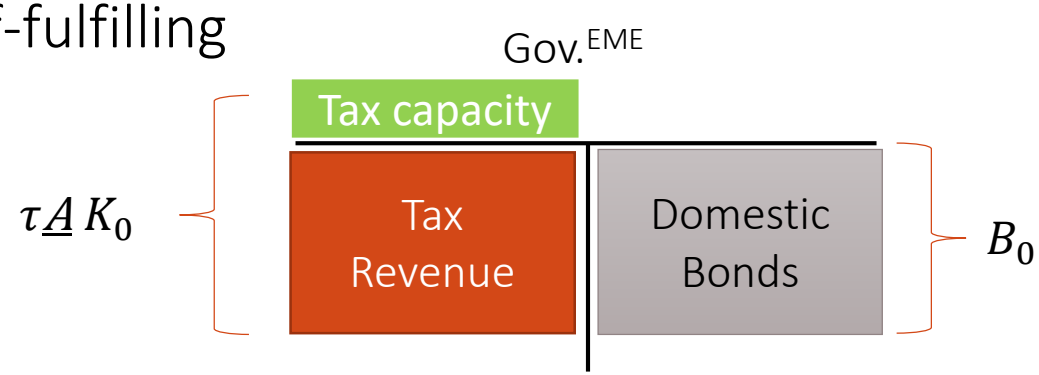
Equilibrium at $t = 1$

- Three possibilities:
  - Fundamental $\mathrm{E}_1\bar{A}$ equilibrium:
    - Weak fundamental, but no sunspot triggers crisis

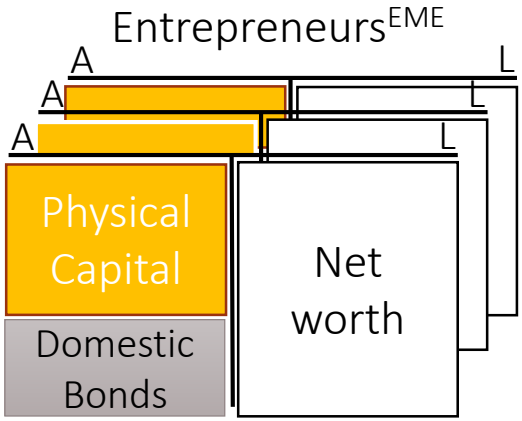


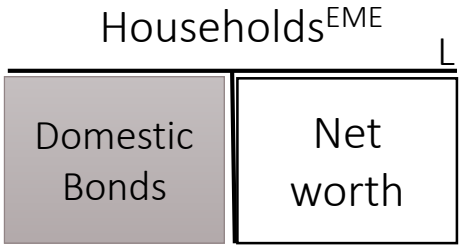
Fundamental $\mathrm{E}_1[\bar{A}]$-equilibrium at $t = 1$

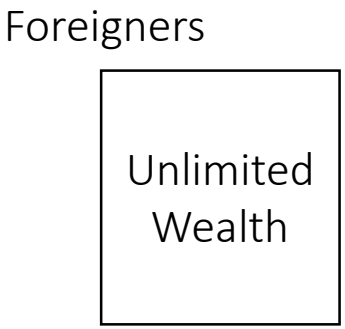
- Similar to equilibrium at $t = 0$
- Weak fundamental ($\bar{\bar{A}}$) but market confidence makes government repayment self-fulfilling



- Asset positions unchanged
- Asset price changes due to time discounting:
  - $q_{1,f} = \beta \mathrm{E}_1[\bar{A}], p_{1,f} = \beta$

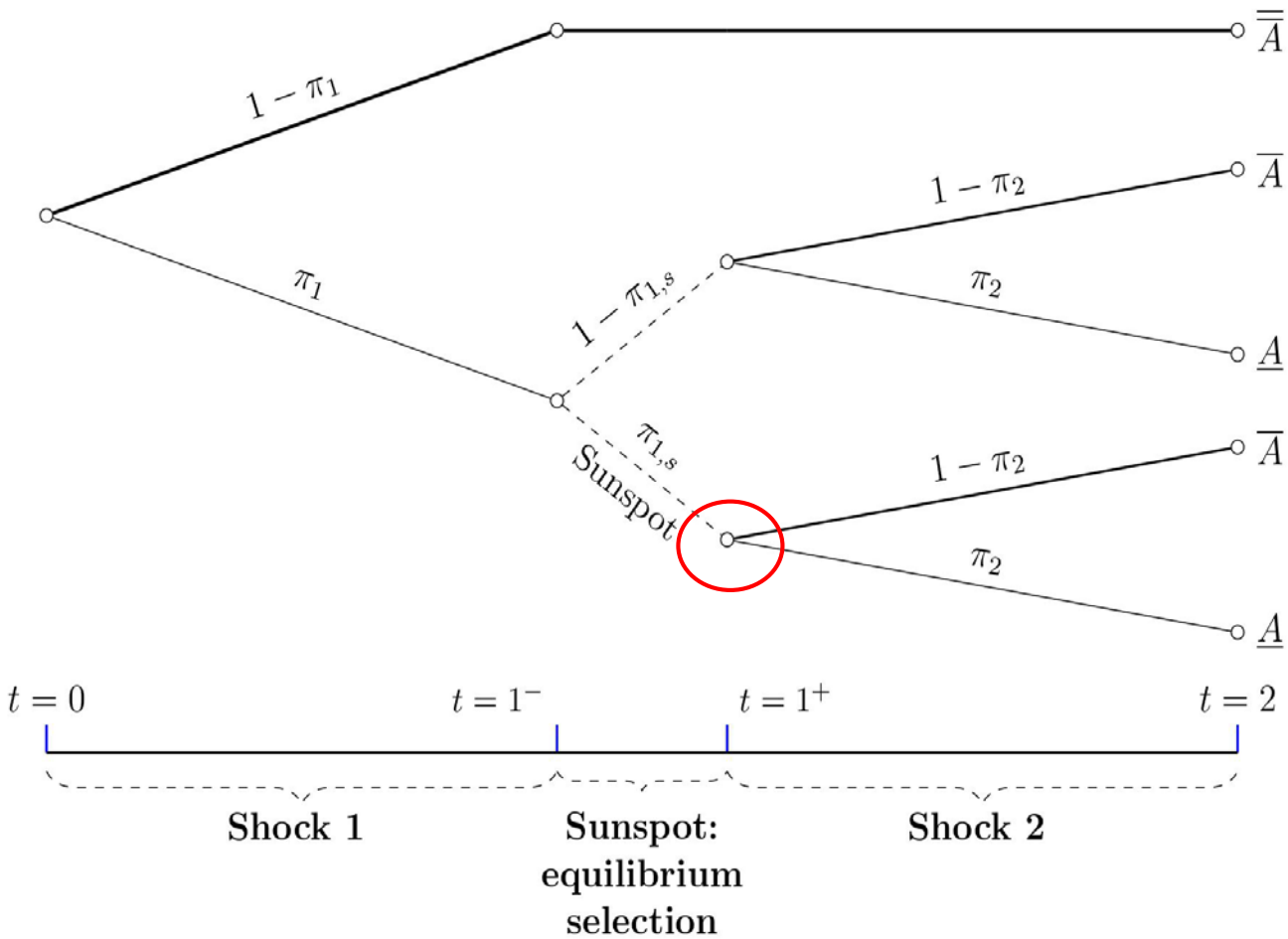






Equilibrium at $t = 1$

- 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

$$q_{1,s} = \underbrace{\beta^*}_{\text{Impatience}} \underbrace{\eta}_{\text{Inefficiency}} \mathrm{E}_1[\tilde{A}] < q_{1,f}\mathrm{E}_1[\tilde{A}],$$

$$p_{1,s} = \beta^*(1 - \pi_2 \underbrace{h}_{\text{haircut}})$$

  - Entrepreneurs hold capital

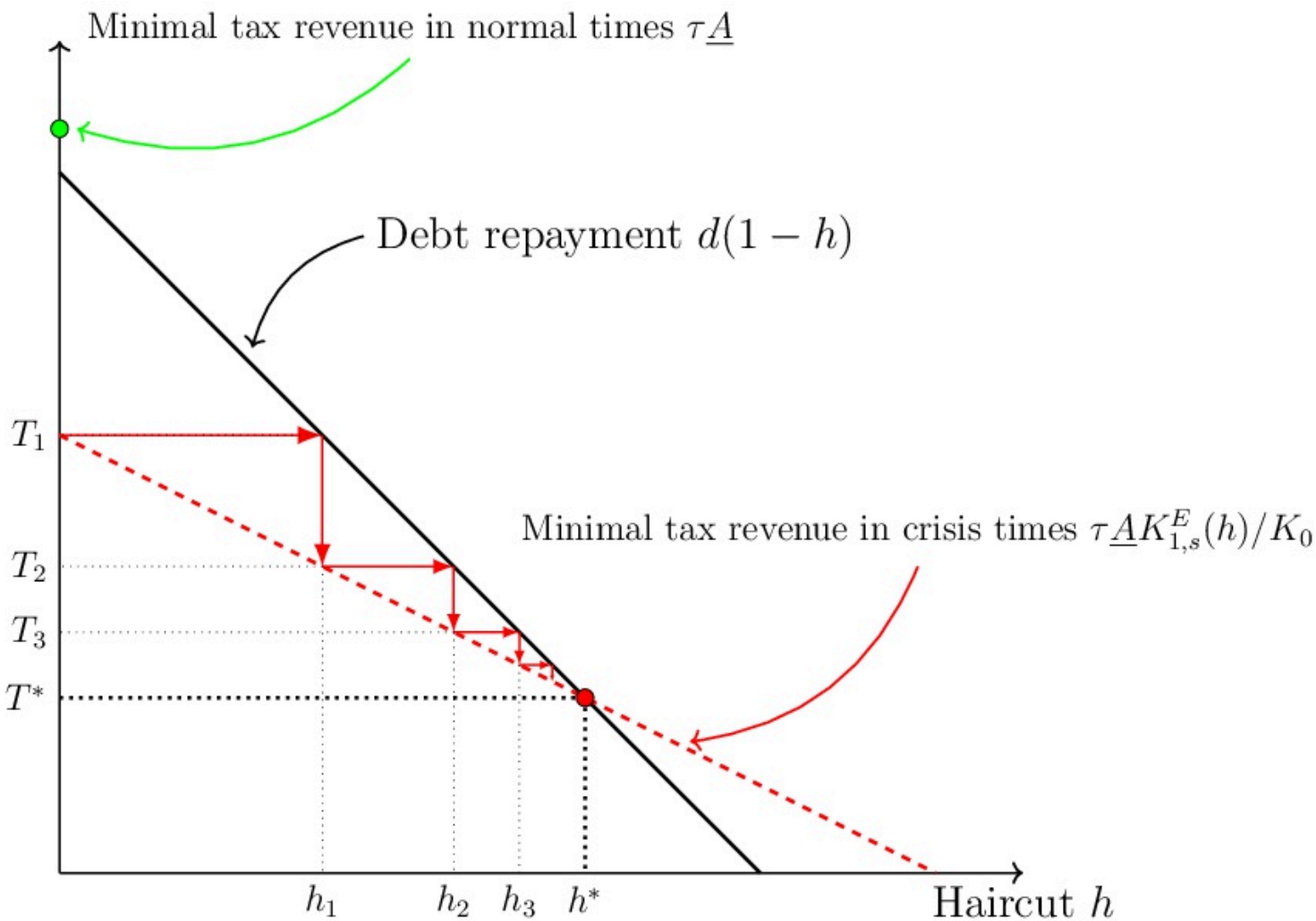
$$K_{1,s}^E = \frac{q_{1,s}K_0 + p_{1,s}B_0^E}{q_{1,s} + \alpha\beta} = \frac{\beta^*\eta E_1[\tilde{A}] + \beta^*(1-\pi_2 h)b^E}{\beta^*\eta E_1[\tilde{A}] + \alpha\beta} K_0 = K_{1,s}^E(h)$$

- Self-fulfilling default:
  - Assume default happens only if $\underline{A}$ realizes (No default for $\overline{A}$)
  - Endogenous debt haircut:

$$B_0(1-h) = \tau\,\underline{A}\,K_{1,s}^E \leftrightarrow d(1-h) = \tau\underline{A}\frac{K_{1,s}^E(h)}{K_0}$$

  - Crisis existence condition: $h > 0$
  - In Fundamental $\mathrm{E}_1[\bar{A}]$ equilibrium: $d < \tau\,\underline{A}$

Self-fulfilling Debt Crisis



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:

$$V^B(x) = [\max\{\alpha, \underline{d}^b\}, \tau\underline{A}\,],$$

$\underline{d}^b$ solves $h(\underline{d}^b) = 0$

- Crisis Severity:
  - The fraction of capital fire sold in a crisis
  - Output loss is linear in this measure
  - In the baseline model:

$$S^B(x) = \max\{0, \frac{\beta^*\eta E_1[\tilde{A}] + (1-\pi_2)\beta^*\alpha}{\beta^*\eta E_1[\tilde{A}] + \beta\alpha - \tau\underline{A}\beta^*\pi_2\frac{\alpha}{d}}\}$$

- Later analyze how policies affect these measure

RoadMap

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  - More detail
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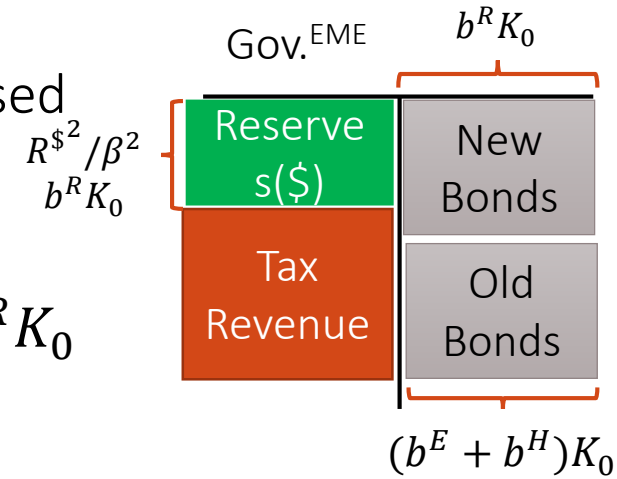
Foreign Reserves

- 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 $R^{\$^2}/\beta^2 b^R K_0$



- Benefit-cost analysis:
  - Given debt hair cut h^R,

$$\frac{R^{\$^2}}{\beta^2} b^R K_0 - (1 - h^R) b^R K_0 =$$

$$\underbrace{\left(\frac{R^{\$^2}}{\beta^2} - 1\right) b^R K_0}_{\text{negative carry}} + \underbrace{h^R b^R K_0}_{\text{debt forgiveness}}$$

Equilibrium

- Subgame equilibriums without crisis is similar

- Focus on flight-to-safety crisis with reserves
  - Fire-sale of capital the same as in baseline

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

  - Endogenous haircut h^R:

$$(b^e + b^h)(1-h^R) + b^R(1-h^R) = \tau\underline{A}\frac{K_{1,s}^{E}(h)}{K_0} + b^R(\beta^2 R^{\$^2})$$

Equilibrium

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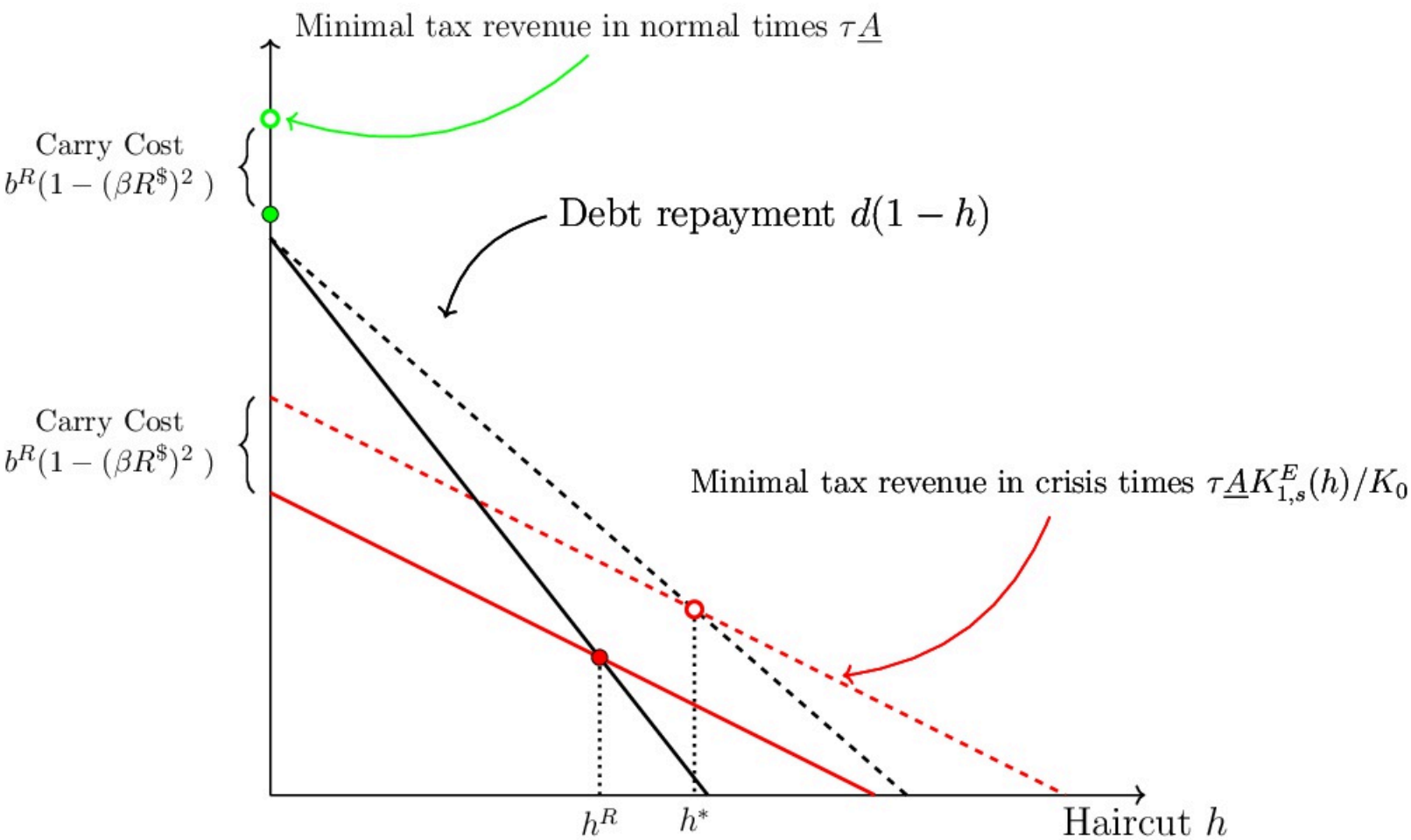
  - Endogenous haircut h^R:

$$(b^e + b^h)(1-h^R) + \underbrace{b^R(1-h^R)}_{\text{New Debt Repayment}} = \tau\underline{A}\frac{K_{1,s}^{E}(h)}{K_0} + \underbrace{b^R(\beta^2 R^{\$^2})}_{\text{Reserves}}$$

  - Crisis existence condition: $h^R > 0$

Self-fulfilling Debt Crisis (With Reserves)



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:

$$S^R(b^R) \leq S^B \Leftrightarrow h^R \geq 1 - \left(\beta R^{\$}\right)^2 \Leftrightarrow h \geq 1 - \left(\beta R^{\$}\right)^2$$

  - Intuition: If crisis is severe enough, debt forgiveness creates gain that exceeds negative carry

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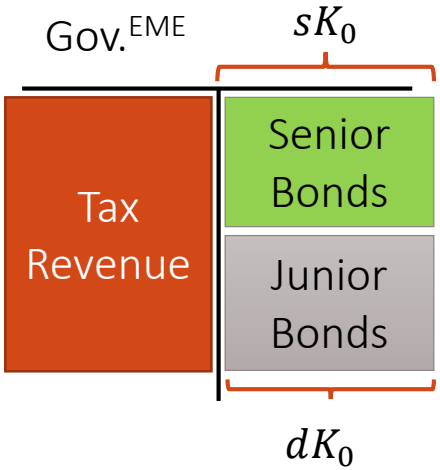
Tranching

- 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 $h^S > 0 \Leftrightarrow h^J = 1$(Junior bonds wiped out)
  - Fire-sale of capital the same as in baseline

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

  - Endogenous haircut h^S:

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

  - 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 $h^S > 0 \Leftrightarrow h^J = 1$(Junior bonds wiped out)
  - Fire-sale of capital the same as in baseline

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

  - Endogenous haircut h^S:

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

    - h^S can be solved from baseline model assume $d = s$
  - Crisis existence condition: $h^S > 0$
    - Tranching is equivalent to eliminate $d - s$ debt burden in crisis

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:

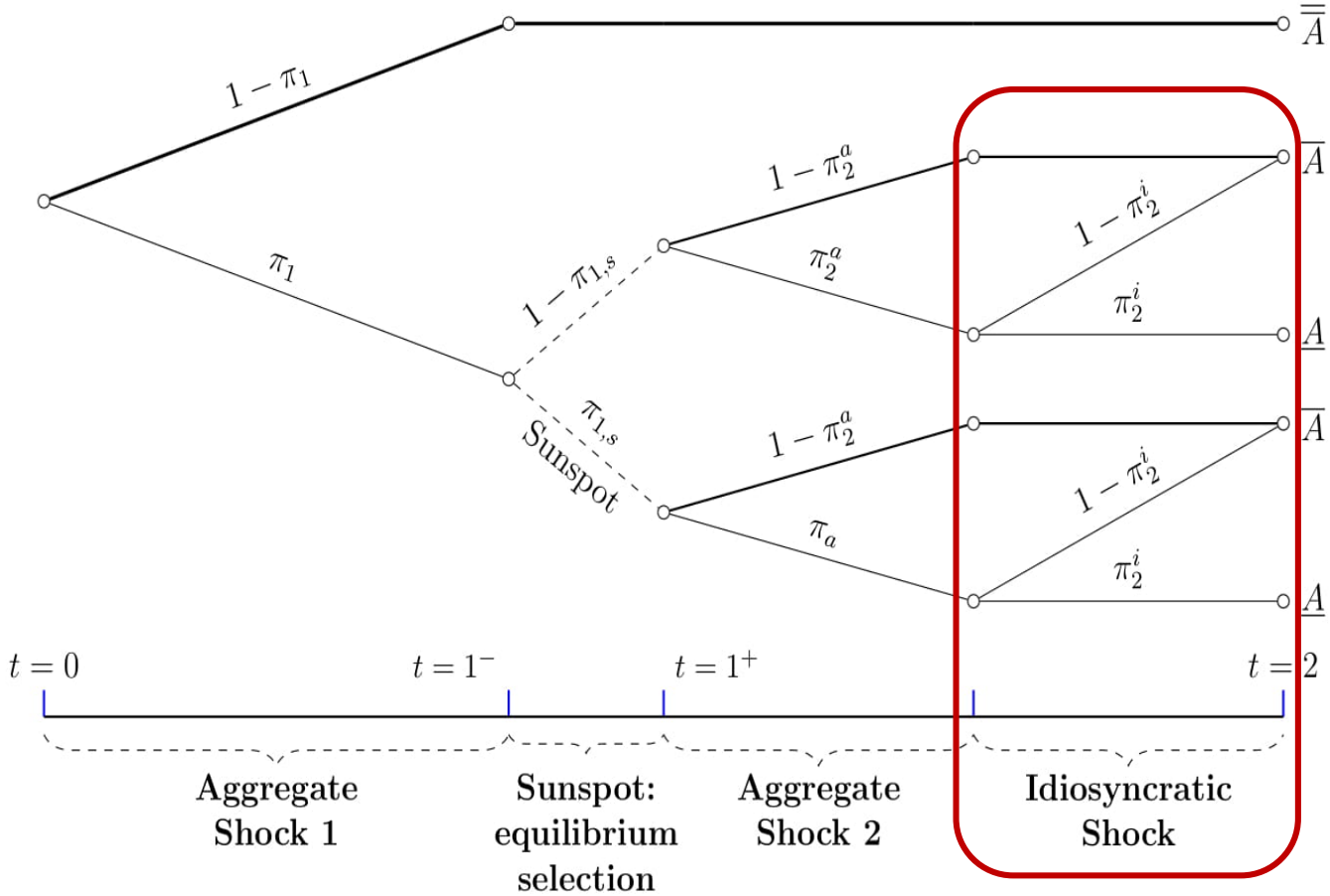
$$S^T(s) = S^B|_{d=s} \leq S^B$$

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

$$\underbrace{s}_{\substack{\text{Issued}\\ \text{safe asset}}} > (1-\pi_2^i) \underbrace{d}_{\substack{\text{repyment of}\\ \text{default free country}}} + \pi_2^i \underbrace{d^B}_{\substack{\text{repyment of}\\ \text{defaulted country}}}$$

  - For national tranching, crisis exists iff

$$s > d^B$$

- Crisis Severity:
  - Compare to national tranching:

$$S^{GloSBies}(s) < S^T(s) = S^B|_{d=s} \leq S^B$$

Conclusion

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

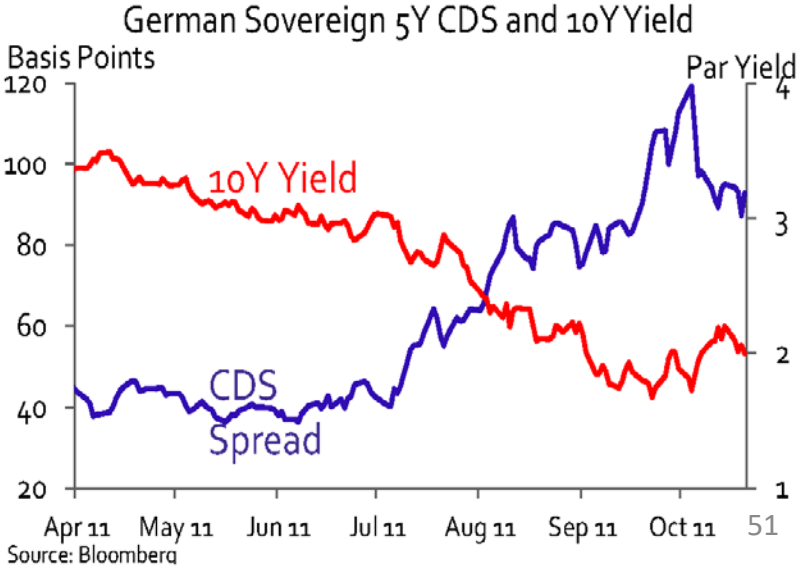
- Global Financial Architecture
  - Buffer approach interventionistic
    - Reserve holding costly due to cost of carry & distortionary
    - IMF support very limited
    - Swap lines Limited (not all IMF member countries)
  - Rechanneling approach self-stabilizing (autonomous)

- 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

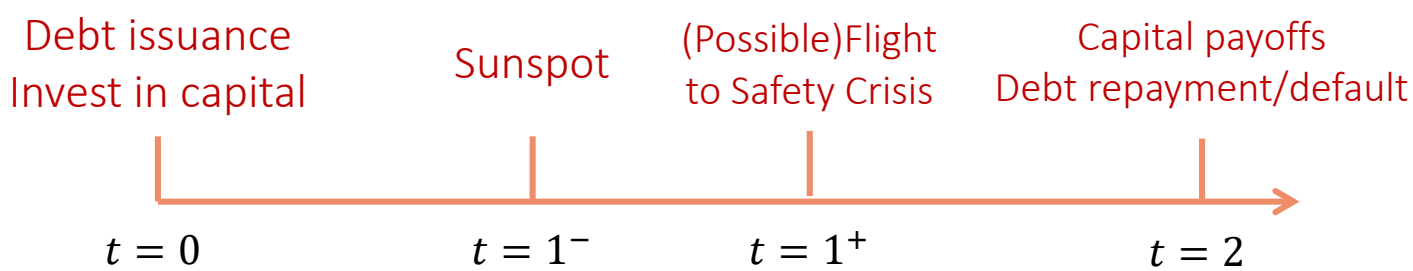
Extra Slide: Safe assets

- "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



Back